

# AAOMPT CONFERENCE, 2008

The following abstracts are to be presented at the 14th annual meeting of the American Academy of Orthopaedic Manual Physical Therapists held in Seattle, Washington from October 29 through November 2, 2008. Presentations are either by poster or plat-

form. These abstracts were peer-reviewed by an AAOMPT committee prior to acceptance for presentation at the AAOMPT conference. However, inclusion of an abstract in this issue does not constitute a peer-reviewed journal publication. The

publication of abstracts alerts readers to research that is presently being conducted. It is hoped that the research presented here in brief will eventually be submitted as full-length manuscripts for review and potential publication.

### PLATFORM PRESENTATIONS

#### EFFECTS OF UPPER EXTREMITY NEURAL MOBILIZATION ON THERMAL PAIN SENSITIVITY: A SHAM CONTROLLED STUDY IN HEALTHY SUBJECTS

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**Purpose:** Neural mobilization (NM) techniques are used by physical therapists in the treatment of patients with cervical and/or upper-extremity symptoms. These techniques have been purported to bias different peripheral nerves based on specific positions of the upper-extremity. While some clinical effectiveness is reported, the underlying mechanisms of NM benefits remain highly speculative. Therefore, the purpose of this study was to compare the immediate and carryover effects of NM to sham NM on a group of asymptomatic volunteers. **Subjects:** 62 asymptomatic graduate and undergraduate student volunteers (46 females, 16 males) between the ages of 18–50 (mean age = 23.7 years) responded to advertisements posted throughout a Health Science Center of a large research university. Inclusion criteria were that individuals were not currently experiencing any neck or dominant upper-extremity symptoms, not having a history significant for a chronic painful condition, and not using pain relievers. **Methods:** A quasi-ex-

perimental design was used. Participants received NM or sham NM three times a week for three weeks, followed by a one week period of no intervention. A-delta (first pain response) and C-fiber (temporal summation) mediated pain perception were determined via quantitative sensory testing (baseline, sessions 1, 9, and one week post session 9). Elbow extension ROM and sensory descriptor measures were measured during median nerve biased neurodynamic positions (baseline, session 9, and one week post session 9). **Analyses:** Data were analyzed with repeated measures ANOVA with treatment (NM and sham NM) as between group factors and follow-up time as within factors. Separate models were used for pain perception, ROM, and sensory descriptors. **Results:** No group differences were noted for A-delta fiber mediated pain perception, but immediate C-fiber mediated hypoalgesia occurred for the NM group but not sham NM group ( $p = .032$ ). C-fiber mediated hypoalgesia was not maintained for carry-over effects ( $p = .104$ ). Increased ROM ( $p = .004$ ) and decreased VAS ratings were identified for *tightness* ( $p = .001$ ), *sharpness* ( $p = .039$ ), and *numbness* ( $p = .021$ ) in the NM group but not sham NM during neurodynamic testing. There were no group differences for *stinging* or *tingling* ( $p > .05$ ). **Conclusion:** This study provides preliminary evidence that effects of NM differ from sham NM. Specifically, NM was associated with immediate C-fiber mediated hypoalgesia, as well as improvements in elbow ROM and symptom descriptors.

Additionally, the sham NM utilized in this study has promising potential for the use in future clinical trials. **Clinical Relevance:** NM has measurable differences when compared to sham NM in measures with clinical importance.

#### THE IMMEDIATE EFFECTS OF A NEURAL DYNAMIC INTERVENTION ON PAIN PERCEPTION IN INDIVIDUALS WITH CARPAL TUNNEL SYNDROME

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**Purpose:** Neural dynamic interventions (ND) are an effective form of manual therapy (MT), in the treatment of certain musculoskeletal conditions; however, the mechanisms behind these techniques are not established. Hypoalgesia has been associated with MT in prior studies and has been interpreted as indicative of both a spinal and supraspinal mechanism. The purpose of this study was to determine whether hypoalgesia to both a standardized noxious stimuli and to self-reports of carpal tunnel syndrome (CTS) pain was immediately associated with a specific ND. **Subjects:** 40 females participated in this study; mean age 46.90 years (SD= 10.25), mean duration 275.09 weeks (SD= 275.41). 27 subjects reported bilateral CT complaints providing a total of 67 involved upper extremities for

analysis. All participants presented with a clinical diagnosis of CT with complaints present for at least 12 weeks. **Methods:** Participants underwent baseline quantitative sensory testing (QST) specific to A $\delta$  and c-fiber mediated pain sensitivity. Pain associated with the QST was quantified using either a mechanical visual analog scale (MVAS) or a numeric rating scale (NRS). Baseline self report of CTS pain was assessed by an MVAS rating of current pain. Participants were then randomly assigned to receive either an ND technique or a sham technique. QST and self report of CTS pain were reassessed immediately following the intervention. **Analyses:** Repeated measure ANOVAs were used to evaluate the interaction between pre and post pain perception and group (direct or sham ND). **Results:** A significant group by time interaction was observed in A $\delta$  mediated pain perception at 49°C ( $F_{(1,65)} = 0, p = 0.05, \text{partial } \eta^2 = 0.06$ ). Pair wise comparison indicated a non significant increase in pain perception in participants receiving the indirect technique (mean difference 4.19 (SD= 20.89)),  $p = 0.24$ , effect size= 0.17) and a non-significant decrease in pain perception in individuals receiving the direct technique (mean difference 6.06 (SD= 19.75),  $p = 0.10$ , effect size= 0.23). Neither group dependent changes nor main treatment effects were observed in c-fiber mediated pain ( $p > 0.05$ ). A main treatment effect ( $F_{(1,65)} = 10.32, p < 0.01, \text{partial } \eta^2 = 0.14$ ) independent of group assignment ( $p > 0.05$ ) was observed for self report of CTS pain immediately following ND. **Conclusion:** A significant group by time effect was observed for A $\delta$  mediated pain perception immediately following ND. Self report of CTS pain showed a main treatment effect immediately following ND independent of group assignment. **Clinical Relevance:** Prior studies have reported hypoalgesia associated with MT; however, the mechanism is not established. We observed group differences in A $\delta$  fiber mediated pain perception suggesting the direct technique may be more effective than the sham technique in mediating pain at the dorsal horn of the spinal cord. Conversely, self report of CTS pain significantly decreased following ND regardless of whether the participants received the direct or sham intervention. This finding provides preliminary evidence that mechanisms independent of a specific biomechanical effect may influence the

immediate effects of ND on self report of CTS pain. Further follow up is necessary to determine if the immediate group specific effects influence long term outcomes.

**AN EXAMINATION OF THE ACCREDITED ORTHOPAEDIC MANUAL PHYSICAL THERAPY POSTGRADUATE RESIDENCY AND FELLOWSHIP TRAINING PROGRAMS IN THE UNITED STATES AND DESCRIPTION OF THE GRADUATES EXPERIENCE**

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**Purpose:** The purpose of the study was to describe the current status of physical therapy post-graduate residency and fellowship training in the United States. The goal of this study was to examine eleven accredited residency programs and thirteen clinical fellowship programs through a thorough qualitative and quantitative examination of the residency training on the graduates. **Subjects:** This first population consists of the residency and fellowship directors of the accredited orthopaedic physical therapy residency and fellowship programs in existence as of April 2001 through 2006. The second population included the graduates of the accredited residency and fellowship programs. **Methods:** The study featured a mixed research design incorporating both qualitative and quantitative components. The questionnaire in its current form (1999 version) is the result of a continuing process of refinement and modification initiated in 1993 by Smith et al. The new questionnaire (1999 version) was pilot tested for both clarity of content and test-retest reliability by nine graduates from Australian manual physical therapy programs and has a test-retest reliability at 90%. The qualitative methodology was guided by van Maxen's approach. **Results:** The response rate of completed surveys was 42%. The study summarizes the descriptive characteristics of the typical graduate. Graduates indicated that the influence of residency and/or fellowship training on their professional development was significant, with the Cronbach alpha score of .82 indicating internal consistency and reliability of responses to questions about career, clinical practice,

education and research. Graduates (69%) attributed changes in their primary positions (clinical practice) to residency and/or fellowship training, (50%) held a secondary position, with the majority holding a position as a clinical specialist. Graduates (61%) have become involved in teaching in a post professional residency or fellowship program. Four qualitative themes emerged as result of undergoing residency and/or fellowship training. This study suggests the graduates experience clinical confidence, clinical reasoning process, lifelong learning, and job satisfaction as a result of undergoing residency/fellowship training. **Conclusions:** This study has served as a beginning point in describing postgraduate orthopaedic residency and orthopaedic manual and fellowship programs for physical therapists in the United States. Residency and/or fellowship training appears to be making a significant contribution to the training of physical therapists.

**GENERALIZABILITY OF A CLINICAL PREDICTION RULE FOR IDENTIFYING PATIENTS WITH LOW BACK PAIN WHO ARE LIKELY TO RESPOND RAPIDLY AND DRAMATICALLY TO THRUST MANIPULATION**

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**Purpose:** A clinical prediction rule (CPR) that accurately identifies a sub-group of patients with LBP likely to respond with rapid and prolonged reductions in pain and disability following thrust manipulation has been developed and validated in a single study. Examination of the generalizability to different clinicians and practice settings is required. We sought to explore the generalizability of the CPR by examining the outcomes in different practice settings. **Subjects:** Patients over a 28 month period attending physical therapy at an outpatient clinic with a primary report of LBP (with or

without symptoms in the lower extremity) were screened for eligibility criteria. Only patients who satisfied the CPR were eligible for participation. **Methods:** All patients provided demographic information and completed a number of self-report questionnaires including the Oswestry Disability Questionnaire (ODQ) and the Numeric Pain Rating Scale (NPRS). Patients underwent a standardized baseline examination then were randomly assigned to receive 1 of the 3 manual therapy techniques for 2 consecutive treatment sessions, after which all patients received the same exercise regimen for an additional 3 sessions. The 3 manual therapy techniques included a supine thrust manipulation, a side-lying thrust manipulation, and a prone non-thrust manipulation. In the primary analysis there were no differences in outcomes at any time point between the supine and side-lying thrust manipulation groups. Therefore, we compared the outcomes of all patients receiving thrust manipulation at one of three clinical settings (Concord, NH, Salt Lake City, UT Los Angeles, CA). Only data from patients receiving a thrust manipulation were used for this analysis. **Analyses:** Differences between practice settings were explored by examining patients receiving the same manipulation technique using a linear model with repeated measures. The ODQ served as the dependent variable, with setting modeled as a fixed effect. The hypothesis of interest was the time by setting interaction which would indicate a differential response over time in different settings for patients receiving a thrust manipulation technique. **Results:** A total of 73 patients (mean age 40.4, SD 11.4) received thrust manipulation and were included in the analysis (41 from New Hampshire, 19 from Utah and 13 from Los Angeles). Comparison of baseline characteristics by setting revealed that patients from Los Angeles were younger, with a lower BMI than patients from either Utah or New Hampshire. Patients from Los Angeles also had higher FABQPA scores and a shorter duration of symptoms than patients from New Hampshire. These variables were therefore modeled as covariates in the analyses. There were no time by clinic interaction present for ODQ ( $p=0.14$ ) or NPRS ( $p=0.41$ ) scores. Further exploration of the pair-wise differences did reveal a difference in ODQ scores at the one-week follow-up between patients treated with thrust ma-

nipulation in the Los Angeles and Utah settings (mean difference = 7.5, 95% CI: 1.1, 13.9) **Conclusion/Clinical Relevance:** In general our results supported the generalizability of the CPR to different settings from which patients were recruited in this study, however additional research is needed to examine this issue. We believe that standardizing the clinical decision-making to use thrust manipulation with the CPR, and standardizing the treatment protocol and dosage will make the results achieved by using the CPR generalizable to different settings.

**EFFECTIVENESS OF AN IMPAIRMENT-BASED MANUAL THERAPY AND EXERCISE APPROACH VERSUS TRADITIONAL TREATMENT IN THE MANAGEMENT OF HEEL PAIN: A RANDOMIZED CLINICAL TRIAL**

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**Purpose:** Heel pain is a common clinical condition encountered by physical therapists; however, the most effective treatments are unknown. Some clinicians frequently use therapeutic modalities including ultrasound, iontophoresis, and cryotherapy, while others prefer an impairment-based manual physical therapy and exercise approach. However, no studies exist to suggest that one approach leads to superior outcomes in patients with heel pain. The purpose of this randomized clinical trial was to compare the effectiveness of two different conservative management approaches in the treatment of heel pain. **Subjects:** Individuals 18–60 years of age with a primary report of heel pain were screened for eligibility criteria. **Methods:** Patients who agreed to participate underwent a standard evaluation and completed a number of patient self-report questionnaires including the Lower Extremity Functional Scale (LEFS), the Foot and Ankle Ability Index (FAAI) and the Numeric Pain Rating Scale (NPRS). Following the baseline examination patients were randomly assigned to receive either traditional treatment (TRAD) or a manual therapy and exercise approach

(MTEX). Traditional treatment included ultrasound followed by iontophoresis with dexamethasone. Patients were then instructed in stretching techniques directed at the soleus and gastrocnemius muscles and strengthening exercises for the intrinsic muscles of the foot. Treatment in the MTEX group included a pragmatic impairment-based manual therapy approach directed at the hip, knee, ankle and foot. Patients also received 5 minutes of aggressive soft tissue mobilization directed at the fascia's insertion at the medial calcaneal tubercle and were prescribed a home program consisting of stretching and self-mobilization. All patients were treated 2 times per week for 2 weeks followed by 1 time per week for 2 weeks for a total of 6 visits. Outcomes of interest were captured at 4 weeks (6<sup>th</sup> visit) and at a 6-month follow-up. **Analyses:** Baseline variables were compared between groups using independent t-tests for continuous data and chi-square tests of independence for categorical data. The primary aim (effects of treatment on pain and disability) was examined with 2-way repeated-measures analysis of variance (ANOVA), with treatment group (TRAD versus MTEX) as the between subjects variable and time (baseline and follow-up) as the within subjects variable. Separate ANOVAs were performed with the NPRS, the LEFS and the FAAI as the dependent variable. For each ANOVA, the hypothesis of interest was the 2-way interaction (group\*time). Planned pairwise comparisons were performed examining the difference between baseline and follow-up periods using the Bonferroni equality at an alpha level of .05. An intention to treat analysis was used with the last value forward substituted for missing data. **Results:** Sixty subjects, mean age 48.0 (SD=8.2), satisfied the eligibility criteria, agreed to participate, and were randomized into the TRAD (n=30) or MTEX group (n=30). Baseline characteristics between the groups were similar for all variables ( $p>.05$ ). The overall 2-way group\*time interaction for the repeated-measures ANOVA was statistically significant for the NPRS ( $p=.030$ ), LEFS ( $p= 0.003$ ), and FAAI ( $p=.006$ ). Planned pairwise comparisons revealed that patients receiving MTEX experienced significantly greater improvements in all outcome measures at the time of the 4-week follow-up. Furthermore, patients receiving the MTEX approach

were significantly better at 6-months as measured by the LEFS. **Conclusions:** The results of this study provide evidence that MTEX is a superior management approach over a TRAD approach in individuals with heel pain. **Clinical Relevance:** Clinicians should consider the use of manual therapy and exercise in the management of patients presenting with heel pain. Future studies should examine the contribution of different components of the exercise and manual therapy approaches.

**ATTITUDES OF PHYSICAL THERAPISTS REGARDING THE UTILIZATION OF THRUST MANIPULATION TECHNIQUES AND SUPERVISION OF PROFESSIONAL DEGREE PHYSICAL THERAPY STUDENTS IN THESE TECHNIQUES IN THE CLINICAL SETTING**

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**Purpose:** The purpose of this study is to describe survey responses regarding orthopedic physical therapists' confidence level in performing and in supervising physical therapy students in thrust manipulation. **Background:** The US accrediting agency for Physical Therapy academic programs, CAPTE, started inclusion of requirements for teaching spinal manipulation (thoracic and lumbar) in 2006. In order to comply with this new regulation, orthopedic instructors that were not familiar with teaching these skills as well as clinical instructors working with Universities began taking courses to orient them to the skills outlined in the Manipulation Education Manual, which was developed jointly by the APTA and the AAOMPT and used as a model for manipulation training. Continuing Education courses are now offered by the AAOMPT and other APTA approved Fellowship programs to help educate orthopedic faculty of Physical Therapy programs as well as Clinical Instructors. The goal is for students to learn thrust manipulation techniques and be able to apply them in their clinical internships so that they will continue to develop their skills and be more likely to continue

using them clinically. **Subjects:** Sixty-six physical therapists, who participated in an extremity and spinal manipulation continuing education course, were queried. The course consisted of the same material being taught to 3<sup>rd</sup> year physical therapy students at the University of Montana and at Pacific University. It was designed to teach potential clinical instructors the same skills as those being taught to the students. **Methods:** An Internet survey instrument was utilized including questions concerning the confidence level in using thrust manipulation techniques, the confidence level in supervising physical therapy students performing these techniques and the demographics of the respondents. **Analyses:** Descriptive statistics of summative scales were used to evaluate and summarize responses. This resulted in frequency of responses to specific questions and these were converted to percentages of the total sample. **Results:** Survey return rates were 35% (23) of 66 solicited. Of the respondents, 88% perform thrust manipulation and 73% were confident in supervising physical therapy students performing thrust manipulation in their clinic. Of the respondents, 74% received their thrust manipulation training at a post-professional level, 70% did not have additional certifications (including manual therapy), 74% serve as clinical instructors, 91% are 31 years old or older, and 74% have practiced for 6 or more years. **Conclusion:** The respondents were confident in performing and in supervising thrust manipulation techniques covered in the manipulation course that they had taken. The majority of survey respondents serve as clinical instructors, have been practicing for a considerable amount of time, and most did not have additional manual therapy certification. Most had not received thrust manipulation training in their professional entry-level education. **Clinical Relevance:** These results suggest that experienced physical therapists not having had prior thrust manipulation instruction can receive training in thrust manipulation techniques and demonstrate confidence in supervising entry-level professional physical therapy students in these skills. This is important to the successful integration of thrust manipulation techniques into the clinical instruction of physical therapy students.

**EFFECTIVENESS OF CERVICAL OR THORACIC HIGH-VELOCITY LOW-AMPLITUDE (HVLA) THRUST MANIPULATIONS PERFORMED BY PHYSICAL THERAPISTS, FOR TREATING INDIVIDUALS WITH MECHANICAL NECK PAIN: A SYSTEMATIC REVIEW**

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**Purpose:** Several systematic reviews evaluating the effectiveness of spinal manipulation have been published. However, to date, none have specifically reviewed the effectiveness of cervical or thoracic region manipulations performed by Physical Therapists (PTs). A systematic review of the literature was done to evaluate the effectiveness of a single session of cervical or thoracic high-velocity low-amplitude (HVLA) thrust manipulations performed by PTs for individuals with mechanical neck pain (MNP). **Subjects:** Articles containing an adult population (18–65 years) were targeted for this review. Individuals with MNP included: both males and females, had a mean age range of 26–43 years, presented with symptoms > 4 weeks, and had mild-moderate disability levels. **Methods:** A literature search across multiple databases was conducted prior to April 2008. Key search words included *manipulation* paired with either *cervical* or *neck*. From the list generated, articles were selected if they were published in a peer-reviewed English language journal and they reported results of a single session of cervical or thoracic region HVLA manipulations performed by PTs. Articles also had to include a detailed description and/or photograph of the HVLA technique used as the intervention, and all interventions had to be performed by a clinician credentialed as a physical therapist. **Analyses:** All articles were systematically graded based on level of evidence, sample size, internal validity, and significance. Evidence was analyzed based on the region that the HVLA manipulations were performed to (cervical or thoracic), then sorted by dosage (single versus multiple levels manipulated) or outcome measure used. **Results:** Six articles (4 randomized controlled trials (RCT) and 2

case series) met the inclusion criteria. All accepted articles had high internal validity. All articles favored manipulations for treatment - four articles revealed strong evidence and two articles had moderate evidence supporting manipulation. **Conclusions/Clinical Relevance:** This review demonstrates that there is both statistical and clinical significance supporting the use of manipulation to address pain, range of motion (ROM), and disability in persons with MNP when performed by physical therapists. A trend favoring manipulation was also identified for pain, ROM, cervical neck strength or patient satisfaction levels. With regards to proper intervention and dosage, there is strong evidence supporting the use of single level cervical manipulations or multiple level thoracic manipulations within a single treatment session. The use of spinal manipulation for MNP produces short term results, with no adverse effects noted, over several outcome measures, and is superior to sham or placebo interventions.

**SHORT TERM OUTCOMES IN PATIENTS WITH A PRIMARY COMPLAINT OF SHOULDER PAIN TREATED WITH CERVICOTHORACIC MANIPULATION: A PRELIMINARY REPORT**

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**Purpose:** Shoulder pain is a common condition, affecting 20–33% of the population at any given time. Over 50% of patients with a new onset of shoulder pain will continue to have symptoms a year later. Recent research has identified impairments in the cervicothoracic spine as a powerful predictor for the onset of shoulder pain, and evidence is emerging that interventions targeting this region may accelerate recovery and improve outcomes in patients with shoulder pain. The purpose of this preliminary report is to describe short-term outcomes achieved by patients with a primary complaint of shoulder pain treated with cervicothoracic mo-

bilization/manipulation. Upon the completion of this study, we intend to develop a clinical prediction rule (CPR) to identify patients most likely to experience rapid and dramatic improvements from cervicothoracic mobilization/manipulation. **Subjects:** A prospective cohort of consecutive patients aged 16 - 65 with a primary report of shoulder pain and a minimum score of 20% on the Shoulder Pain and Disability Index (SPADI) were invited to participate. Subjects were recruited from 4 clinical sites across the United States. **Methods:** Eligible patients who consented to participate completed a series of self-report measures followed by an extensive standardized history and physical examination including a wide array of tests and measures commonly used in the examination of patients with shoulder pain. Regardless of the results of the clinical examination, all patients received a standardized treatment regimen consisting of cervicothoracic mobilization/manipulation (including thrust techniques to the thoracic spine and non-thrust techniques to the lower cervical spine), and self-mobilizations directed at the cervicothoracic spine. There were no interventions specifically targeting the shoulder. At the follow-up session 2–4 business days later, patients again completed the self report measures. We *a priori* identified the criterion for success using the patient-reported global rating of change (GRC). Success was defined as a patient report of *moderately better, quite a bit better, a great deal better, or a very great deal better* compared to the initial examination (GRC scores of +4 to +7), whereas non-success was defined as a patient scoring a -7 to +3 on the GRC scale. Patients scoring less than a +4 at the second session were treated again, and completed a third and final follow-up 2–4 business days later. At this follow-up, the patients again completed the self report measures and were subsequently classified as having experienced a successful outcome or not. The self report measures administered at all visits included the SPADI and the Numerical Pain Rating Scale (NPRS). **Analyses:** Descriptive statistics were calculated to describe baseline characteristics and outcomes achieved by all subjects, as well as the groups classified as success and non-success. **Results:** 27 subjects (9 males; mean age 36.6 years) have been enrolled to date. 70% of all subjects (n=19) were clas-

sified as *responders*, meaning they met the established threshold for success. Of the 8 subjects who did not achieve success, 3 subjects reported *no change* (GRC=0), 3 reported being *a tiny bit better* (GRC=1), and 2 reported being *a little bit better* (GRC=2). No subjects worsened on the GRC. The mean age for responders was 38.1(15.4) years and 32.8 (12.3) years for the non-responders. The median duration of symptoms for responders was 29.5 days (range 1–1220 days) and 146.5 days (24–631) for non-responders. The baseline score on the SPADI was 38.3% (15.4) for responders and 31.9% (15.6) for non-responders, and the total percent improvement on this scale was 19.4% (95% CI: 9.8–29.0) ( $p<.0.001$ ) and 9.4% (-1.6–20.3) for responders and non-responders, respectively. The average NPRS rating (a combination of the current, best and worst pain in the last 24 hours) was 4.3 (1.8) for responders and 3.8 (1.7) for non-responders, while the improvements in pain scores was 2.7 (95% CI 2.1–3.3) ( $p<.0.001$ ) and 0.5 (-0.3–1.3) for responders and non-responders, respectively. Painfree shoulder flexion increased significantly ( $p<.0.001$ ) in both responders (29.2 degrees, 95% CI 21.3–37.2) and non-responders (14.8 degrees, 8.1–21.4). The final GRC score was 4.9 for responders and 0.88 for non-responders. **Conclusions/Clinical Relevance:** The results of this analysis demonstrate that patients with a primary complaint of shoulder pain can achieve clinically meaningful improvements in pain, disability, and ROM when treated with cervicothoracic manipulation. Seventy percent of the subjects were classified as a success, and no subject reported a worsening of symptoms. Upon completion of the study, we will attempt to develop a CPR for predicting which patients with shoulder pain will experience a successful outcome from this intervention. The criteria in the CPR may be used in future clinical trials to improve the power of clinical research in patients with a primary complaint of shoulder pain and serve as the basis for a future validation study.

**CHANGES IN STADIOMETRIC TRUNK HEIGHT MEASUREMENTS FOLLOWING SUSTAINED LUMBAR FLEXION AND EXTENSION POSTURES**

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**Background:** Decreased intervertebral disc height can result in reduced stability and load carrying capacity of a spinal segment. Methods of accurately and precisely assessing the intervertebral disc capacity for imbibing and losing fluid are critical. **Purpose:** To validate our stadiometer measurement protocol and to determine if supine flexion and prone extension recovery postures resulted in increase spine height following a period of sustained spinal loads. **Study Design:** A pre-test, post-test cross-over design was used. **Methods:** Stadiometry was used for spine height measurements. A one sample t-test was used to compare spine height changes following five minutes of sitting in the current study and previously published validated findings. A paired t-test was used to evaluate the effects of supine flexion and prone extension lying on spine height as compared to loaded sitting. A paired t-test was used to evaluate the change in height following flexion and extension recovery positions. **Results:** Ten women and eleven men (mean age 24 years, SD = 2.6) participated. No significant difference existed between our mean height change following five minutes of sitting and previously published validated findings. A significant increase in height was reported for both supine flexion and prone extension lying ( $P < 0.01$ ). The mean height gain was 3.11 mm using the prone extension protocol and 3.19 mm using the supine flexion protocol. No significant difference existed between these two recovery positions ( $P = 0.93$ ). **Conclusion/Clinical Relevance:** Our stadiometer measurement protocol was valid for detecting changes in trunk height. Both sustained flexion and extension lying positions were equally effective for increasing spine height, and could be proposed as techniques to offset spinal shrinkage and the biomechanical consequences of sustained loads.

**INTER-TESTER AND INTRA-TESTER RELIABILITY OF MEASURING SPINAL HEIGHT CHANGES USING A STADIOMETER**

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**Background:** There is a strong need for efficient and economical ways of collecting data on patients with low back pain in the clinical setting. To date, all research studies examining spinal height changes have used custom stadiometers but none have explored more readily available, commercial models. **Purpose:** To establish inter-tester and intra-tester reliability of a commercially available stadiometer for measuring spinal height changes. **Methods:** The inter-tester reliability section of the study incorporated thirty asymptomatic subjects versus 29 asymptomatic subjects for the intra-tester reliability section. Subjects' ages ranged from 21 to 50 years (mean  $\pm$  SD 27.5 + 7.7). All subjects had the changes in their spinal height measured after being seated in a stadiometer for 10 minutes with a 4.5 kg placed on each shoulder. The load was removed and measurements were taken every minute for five minutes by two different testers. After the measurements were taken, the subjects were positioned in supine for 10 minutes. This procedure was repeated two more times and these two measurements were taken by one tester. Both testers were experienced physical therapists with a background in manual therapy. **Results:** Standard deviation for the inter-tester reliability section ranged from 1.01 mm through 2.93 mm and for the intra-tester reliability from 1.58 mm through 2.12 mm. Data analysis showed that the means of the standard deviations were smaller than the mean difference, indicating that both the one-tester and two-tester models produced low variability and good reliability. The intraclass correlation coefficient (1,1) was 0.99 for both testing sequences, indicating good consistency and agreement for the measurements. **Conclusion/Clinical Relevance:** There is good reliability for one and two testers to measure spinal height

changes in a group of asymptomatic subjects. Further research would be beneficial to evaluate the validity of the stadiometer to measure intervertebral disc hydration and to assess the efficacy of physical therapy interventions to modulate disc hydration in patients with low back symptoms.

**IMMEDIATE EFFECTS OF SOFT TISSUE MOBILIZATION AND JOINT MANIPULATION INTERVENTIONS ON LOWER TRAPEZIUS STRENGTH**

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**Purpose:** Grade V manipulation has proven to provide immediate strength improvements on lower trapezius strength in a normal population. Augmented soft tissue mobilization (ASTYM) has been utilized as a manual therapy intervention for tendinopathy and other pathologies, but its contribution to immediate improvement in lower trapezius strength in a normal population has not been investigated. Determining effectiveness of soft tissue mobilization versus joint manipulation may allow the clinician to make an informed decision as to which treatment has an immediate positive effect on lower trapezius muscle strength. **Subjects:** Forty-one subjects were randomly assigned to one of four groups: ASTYM (n=10), ASTYM followed by thoracic spine manipulation (n=10), thoracic spine manipulation (n=10) and a control group (n=11). Subjects were screened for eligibility. **Methods:** One week prior to data collection subjects underwent a pre-test session to become familiar with the testing method and avoid a learning effect. During the actual study, subjects were first tested for lower trapezius strength while supine with arms overhead in the recommended testing position as per previous studies. Subjects were then randomly assigned to an intervention group via drawing of a concealed number. The specific intervention was then implemented, followed by immediate retesting of lower trapezius strength as done previously. **Analyses:** Post-intervention strength (in kilograms) was subtracted from pre-intervention strength for a difference score. A one-way analysis of variance (ANOVA) was used to determine whether there was a dif-

ference among the four groups. Alpha level was set at .05. Bonferroni post hoc comparisons were conducted. **Results:** Omnibus F test identified differences among the means. Post hoc analyses showed that manipulation resulted in significantly greater improvement ( $p \leq .05$ ) in immediate lower trapezius strength as compared to the other two treatment groups and control group. **Conclusion/Clinical Relevance:** Manipulation increases lower trapezius strength in the short term to a greater degree than the use of ASTYM, ASTYM followed by manipulation, or no intervention. Clinically, these preliminary results support previous study findings regarding the utilization of manipulation to the mid to lower thoracic spine. The use of a specific soft tissue mobilization technique does not appear to be of benefit prior to manipulation or by itself for the immediate improvement of lower trapezius strength. Future studies, as well as continuance of the current study, is recommended prior to making specific recommendations to clinicians on the most effective manual therapy intervention.

**DIFFICULTIES ENCOUNTERED WITH THE USE OF REAL-TIME ULTRASOUND (RTUS) AND THE OSWESTRY DISABILITY INDEX (ODI) IN RESEARCH WITH PERSONS IN A COUNTY HOSPITAL SYSTEM WITH CHRONIC LOW BACK PAIN (CLBP)**

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**Background and Purpose:** There has been growing support for use of RTUS to evaluate changes in the transverse abdominus (TrA) recruitment in persons with CLBP. The use of the ODI has become a standard in clinical research in persons with LBP. However, no research has been performed using these tools in an underserved population. The purpose of this study was to evaluate the feasibility of utilizing RTUS and the ODI in persons in a county hospital system with CLBP. **Methods:** Patients that presented with the diagnosis of CLBP to a county hospital outpatient department were recruited. All consenting participants completed the ODI and underwent RTUS

testing. An evaluation was completed, and a lumbar-region manipulation was performed. TrA recruitment was immediately retested and the patient received instruction in a home DLS program. Each participant returned for a total of 8 sessions. RTUS and the ODI were retested after 4 and 8 weeks. **Results:** Over 30 patients were approached, with only 6 able and willing to participate. Of the 6 patients, only 3 completed the study. There was one male and two females, ages 45, 44, and 52. Body mass index for the three were 21, 31, and 43. All participants reported insidious recurring LBP for years. None reported exercising regularly. None of the participants worked full-time. All reported a household yearly income of \$10,000 or less. Baseline ODI scores were 58, 58, and 58. RTUS measures demonstrated no meaningful change over time. Two of the 3 participants had clinically meaningful improvement in their ODI from baseline to 8 weeks. **Conclusion/Clinical Relevance:** CLBP is the most common diagnosis encountered in the outpatient physical therapy department in the county hospital system, yet recruitment and retention for research studies in this population remains limited. Possible reasons for this include co-morbidities, language and literacy problems, transportation difficulties, and home environment and personal challenges. Based on this limited data, it appears that RTUS may not be a necessary tool to track efficacy of a DLS program. The ODI did improve in 2 of the 3 participants, yet other subjective reports and clinical observations led the researchers to question the validity of the ODI score as representative of the patient's functional status. Clinical observation suggests that there may be limited literacy and understanding of the questions in the ODI that limit the validity in this population. Further research is necessary with this population before considering the ODI as a future outcome measure.

**THE INTRA-RATER RELIABILITY OF DETECTING A MOBILITY RESTRICTION IN THE LUMBAR SPINE BY STATIC PALPATION AND POSITION ASSESSMENT**

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**Purpose:** The osteopathic method to assess for a *segmental dysfunction* has been reported by numerous authors yet the reliability of this measure in symptomatic subjects has not been established. This study sought to determine the intra-rater reliability of making a palpatory assessment for a mobility restriction in flexion or extension at a single segment at the lumbar spine. **Subjects:** 750 patients were screened from May 2005 to December 2006. Fifty-five subjects met the following criteria for inclusion: only one identified segmental dysfunction at the lumbar spine; chief complaint of pain in the lumbar spine, buttocks, and/or lower extremity; Oswestry Disability Index (ODI) score between 30% - 60%; and at least four of the five clinical predictors for success with manipulation as described by Flynn et al. Exclusion criteria included current pregnancy, signs consistent with a nerve root compression, and prior lumbar surgery. **Methods:** This prospective, single-group repeated measures design involved three sessions with two to three days between each session. Day 1 consisted of a standardized physical examination to determine eligibility (to include the initial ODI score) followed by a segmental-specific palpatory assessment of the lumbar spine. This assessment sought to find asymmetry at the transverse processes along the transverse plane. No treatment was provided on Day 1. The palpatory assessment was performed again on Day 2 followed by a single muscle energy technique intervention that consisted of four isometric muscle contractions. The intervention was specific to the assessment made on Day 2. The examiner was blinded to the assessment made on Day 1: the findings were recorded outside of the medical record by a research assistant and no marks were placed on the body. The patient returned on Day 3 and completed the final ODI score. **Analyses:** Two criteria

had to be met in order for the assessment to be considered a success: 1) the mobility restriction assessment performed on Day 1 and Day 2 had to be identical and 2) a 12-point difference between initial and final ODI scores had to be reported. This reflects twice the reported Minimum Clinically Important Difference (2 x MCID) in ODI Scores. The mean pre- and post-test ODI scores for all subjects were 50 and 35 respectively. **Results:** The examiner made an identical mobility restriction assessment on 51 out of 55 patients and all 51 patients experienced  $\geq 2$  x MCID in their follow-up ODI. The number of agreements for each mobility restriction were as follows: 1) Right Flexion (12/14, (85.7%)); 2) Left Flexion (14/15, (93.3%)); 3) Right Extension (8/9, (88.8%)); 4) Left Extension (17/17, (100%)); The overall intra-rater reliability for assessing a mobility restriction at a single lumbar spine segment was  $\kappa=0.90$  ( $p<0.01$ ). Kappa values for specific mobility restrictions were also calculated as follows: 1) Right Flexion 0.714 ( $p<0.01$ ); 2) Left Flexion 0.867 ( $p<0.01$ ); 3) Right Extension 0.778 ( $p<0.01$ ); 4) Left Extension 1.0 ( $p<0.01$ ). Mean differences in ODI scores for the group were also significant ( $p<0.01$ ). A +LR for treatment success (given Day 1-Day 2 agreement) was calculated as 28.67. This suggests > 95% post-test probability of treatment success when agreement is present. **Conclusion:** The operational definition investigated for determining a mobility restriction assessment in flexion or extension at a single segment at the lumbar spine showed excellent intra-rater reliability. **Clinical Relevance:** Further research could be expanded across sites to determine inter-rater reliability and over a longer time horizon in order to establish the effectiveness of this form of assessment.

**ANTERIOR-POSTERIOR PALPATION OF CERVICAL SPINE: ANATOMIC STUDY**

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**Purpose:** Many manual therapists use anterior-posterior palpation of the cervical spine. Other than stating that the pressure

should be directed at the anterior tubercles, previous authors did not quantify how to palpate to avoid performing a carotid sinus massage instead. Therefore, the purpose of this study is to investigate the anatomical landmark of the carotid sinus and common carotid artery so as to avoid it when performing anterior-posterior palpation of the middle to lower cervical anterior tubercle. **Subjects:** 4 embalmed cadavers (2 males and 2 females; mean age of 78, range 65 to 92). **Methods:** 8 carotid arteries were dissected. Measurements were taken using a Venier caliper. **Analyses:** Descriptive mean distance from midline to medial carotid artery system (common carotid or carotid sinus) was used to quantify the location of the carotid sinus and common carotid artery at the hyoid and thyroid/cricoid cartilage levels respectively. **Results:** All 4 hyoid lie anterior to C3, all thyroid cartilages lie anterior to C4 and C5 and all 4 cricoid cartilages lie anterior to C6 vertebra. The right and left common carotid arteries lie anterior to the anterior (carotid) tubercles. C3/4 disc corresponds to C4 anterior tubercle, C4/5 to C5, and C5/6 to C6. Midline to lateral hyoid border distance averages 2.05 cm (range 1.7 to 2.5). At the hyoid level, midline to right medial carotid sinus distance averages 2.45 cm (range 2 to 3), left 3.12 cm (range 2.4 to 4.4); midline of C3/4 disc level to medial border of uncinat process average distance is 0.93 cm (range 0.82 to 1.1). Midline to lateral thyroid border mean distance is 2.3 cm (range 2 to 2.5). At the level of thyroid cartilage, right midline to medial border of common carotid artery mean distance is 2.45 cm (range 1.6 to 3), left 2.65 cm (range 2.35 to 3.2). From midline of C4/5 disc level to medial border of uncinat process average distance is 0.96 cm (range 0.8 to 1.05); midline of C5/6 disc to medial uncinat mean distance is 1.06 cm (range 0.82 to 1.2). At the level of cricoid cartilage, right midline to medial border of common carotid artery average distance is 2.15 cm (range 1.8 to 3), left 2.64 cm (range 2.3 to 3.15). **Conclusion:** The anterior tubercles of C4 to C6 may not be palpated directly using anterior-to-posterior pressure because of the overlying location of the carotid sinus and the common carotid arteries. The hyoid, thyroid, and cricoids cartilages may have to be moved contralaterally to allow more room for palpation. **Clinical Relevance:** The hyoid, thyroid, and cricoid

cartilages may be used as landmarks when performing anterior-posterior pressures.

**POSTER PRESENTATIONS**

**DIFFERENTIAL DIAGNOSIS OF A PREVIOUSLY UNDIAGNOSED VERTEBRAL FRACTURE: THE ROLE OF THE ORTHOPEDIC MANUAL THERAPIST**

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**Study Design:** Case report. **Purpose:** 1) To describe the clinical reasoning and differential diagnosis by a physical therapist of a previously undiagnosed vertebral fracture. 2) To illustrate the need for thorough assessment and correlation of these findings with imaging studies. 3) To highlight the increasing role of the orthopedic manual physical therapist as diagnostician and consultant in US healthcare. **Background:** Acute low back pain is a common symptom for which people seek healthcare in the US. Due to the wide variance of clinical severity, symptom presentation, and examination findings, clinicians in primary care must be aware of and screen for *red flags* or co-morbidities that could adversely impact a patient's recovery and function or place the patient at risk for serious medical consequences. Thorough assessment, including palpation must be undertaken, and correlated with imaging findings. **Case Description:** An 85 year old female presented to physical therapy on an open-ended referral from her primary care physician. Her main complaint was acute low back pain of 3 weeks duration that was severe and without improvement. Initial medical intervention by her primary care physician included lumbar spine radiographs, but abnormal findings at L1 were misinterpreted. The patient was subsequently referred to physical therapy. **Analyses:** During screening, five clinical features that raised the suspicion of vertebral fractures were identified through the patient's responses, historical findings, and tests and measures: 1) First onset of back pain at age 85:  $LR+=4.4$  if  $\geq$  age 75; 2) Female gender:  $LR+=2.3$ ; 3) Major trauma:  $LR+=12.8$ ; 4) Pain and tenderness:  $LR+=6.7$ ; 5) Distracting painful injury:  $LR+=1.7$ . A co-morbid

diagnosis of osteoporosis was also noted. The patient's lack of pain relieving positions, her incongruent painful movement pattern, the presence of comparable signs of pain with palpation over T11, 12, L1, and the knowledge that these areas had not been adequately imaged added to the suspicion of pathology not appropriate for physical therapy intervention. **Results:** Thoracic spine radiographs revealed a T11 compression deformity with more than 50% height loss anteriorly and 40% height loss posteriorly. The CAT scan revealed a comminuted compression deformity at L1 with a fracture line across the right pedicle body, a 3 mm retropulsion of the posterior superior endplate and a 1 cm canal narrowing with an approximate 65% height loss of the vertebral body. **Conclusion:** This case highlights the use of appropriate screening procedures in patients with acute low back pain and accurate identification of pathology. Adequate hypothesis generation, thorough assessment and clinical reasoning allows for proper consideration of potential causes of LBP. The case highlights the role of the physical therapist as consultant in primary health care and provides evidence that direct access for physical therapists, as practiced elsewhere in the world and in the US military, could be an effective and cost efficient way to manage musculoskeletal complaints.

**USE OF THRUST AND NON-THRUST MANIPULATION IN RECURRENT LUMBAR RADICULOPATHY: A CASE REPORT**

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**Purpose:** To describe the examination, manual physical therapy interventions and use of neurodynamic mobilizations for a patient with an acute (30 days) episode of recurrent lower back pain with radiculopathy. The purpose is to outline the use of thrust, non-thrust mobilization/manipulation coupled with neurodynamic mobilization exercises for an individual with recurrent lower back pain. **Case Description:** A 36 year old male nurse in a local Emergency

Department with a thirty day history of an acute, insidious episode of lower back pain with radiating symptoms into his left foot. His concordant symptoms were most provoked with lumbar flexion, but extension did not centralize his symptoms. He self-rated his radicular symptoms as more intense than his axial back symptoms. He had been prescribed oral Vicodin by his referring physician and was placed on clerical duties due to his back and radicular symptoms. Utilizing the clinical-decision making algorithm, published in Fritz et al 2007, this patient did not fit clearly into one of the matched intervention categories of manipulation, traction, specific exercise or stabilization. First visit, he was positioned into the lumbar sidelying manipulation position and non-thrust mobilizations were performed. Non-thrust mobilizations were increased from grade II to grade IV based on the patient's response. The patient had *lightening* of his radicular symptoms when in the sidelying position. Second visit, he continued to experience a decrease in the intensity of his radicular symptoms. He did not experience muscle spasm at end-range or increase in his radicular symptoms, therefore thrust manipulation was performed followed by a home exercise program of supine neurodynamic mobilizations and abdominal bracing. The third visit, included lumbar sidelying thrust manipulation and specific exercise progression for lumbar stabilization with continued neurodynamic mobilizations. **Baseline Measures:** Oswestry = 42%, NRPS = 3/10, numbness rating = 7/10, no clear directional preference, no aberrant movement and FABQ work subscale = 12. Baseline objective measures: (+) left straight leg raise at 36°, (-) crossed straight leg raise, (-) prone instability test, (+) left > right slump test (32° > 46°), lumbar flexion = 30°, mild left extensor hallucis longus weakness and 2+/4 deep tendon reflexes for ankle and knee jerk. Significant progress in subjective and objective measures was noted following three visits over three weeks (one visit per week). **Final Measures:** Oswestry score 6%, NPRS 0/10, numbness 1/10 intermittently and global rating of change +6. Final objective outcome measures: lumbar flexion 70°, SLR on the left 86°, slump on the right 75° and left 80°. Patient returned to work with no limitation and reported decreased medication use. **Conclusion:** This patient experienced a rapid improvement in pain

and functions after non-thrust and thrust manipulation to the lumbar spine and supine lower extremity neurodynamic mobilization techniques. **Clinical Relevance:** A combination of thrust and non-thrust mobilization/manipulation and lower extremity neurodynamic mobilization techniques may be helpful in patients with chronic recurrent, low back pain with radicular symptoms.

**THE EFFECTS OF JOINT AND SOFT TISSUE MANIPULATION WITH SPORT SPECIFIC TRAINING IN A COLLEGIATE BASKETBALL PLAYER WITH RECURRENT FRACTURE OF THE 5<sup>TH</sup> METATARSAL: A CASE REPORT**

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**Purpose:** Foot pain and fractures of the 5<sup>th</sup> metatarsal are common in basketball players. The effectiveness of joint and soft tissue manipulation with basketball specific training as means of non-surgical intervention for foot pain has not been clearly established in this population. The purpose of this study was to demonstrate the effectiveness of joint and soft tissue manipulation and exercise to facilitate proper biomechanics of the lower kinetic chain during basketball play for athletes with recurrent fractures of the 5<sup>th</sup> metatarsal. **Subject:** Twenty-one year old male collegiate basketball player. **Methods/Analyses:** Examination of lower extremity and lumbo-pelvic complex including running and sport specific video analysis. The level of pain during testing was employed using Visual analog pain scale. Measurements related to hip/ankle AROM/PROM, lateral bound, plyometric jumps and dynamic single leg balance were assessed. Joint and soft tissue manipulations were performed to the hip and foot/ankle complex to improve joint capsular mobility and AROM. A strict therapeutic exercise regime was implemented with daily HEP instruction. **Results:** Hip and foot/ankle ranges of motion increased following joint and soft tissue manipulation. Pain scale ratings, range of motion, gait observations, functional basketball related jumps and return to play served as outcome mea-

tures. Follow-up measurements were taken at 6 weeks and 3 months which revealed ROM and symptoms were consistent with measurements at discharge. **Conclusion:** This case demonstrates the importance of identifying tissue specific impairments that may be contributing to the recurrent stress fractures of the 5<sup>th</sup> metatarsal common in basketball players. Joint and soft tissue manipulations used to mobilize the patient's hip and rear foot promoted proper biomechanics through the lower extremity and thus decreased the stress and strain placed on the patient's 5<sup>th</sup> metatarsal. Further research is necessary to determine the clinical criteria for the manipulations chosen and for the specific analysis of ground reaction forces on the 5<sup>th</sup> metatarsal during basketball play. **Clinical Relevance:** Often physical therapists are faced with patients who are trying to avoid surgery, in this case for recurrent fracture of the 5<sup>th</sup> metatarsal. It is critical that the orthopaedic manual physical therapist completes a thorough lower extremity and functional movement examination in order to identify tissue specific impairments that may be contributing to the stress in the foot. As physical therapists, we must demonstrate competency in accurate examination as well as choosing the most specific interventions for that patient. This case report indicates that proper physical therapy diagnosis and intervention can result in successful outcomes when the patient with recurrent fractures of the 5<sup>th</sup> metatarsal does not want operative intervention as means to reduce pain and increase function.

**THE EFFECTS OF HIP MOBILIZATION AND MOBILIZATION WITH MOVEMENT IN THE PHYSICAL THERAPY MANAGEMENT OF A PERSON WITH LATERAL HIP PAIN: A CASE REPORT**

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**Purpose:** Mulligan's mobilization with movement (MWM) is a manual therapy technique commonly used by physical therapists. However, minimal evidence

supports its effectiveness. The purpose of this case report was to describe the use of hip joint mobilization, MWM, and therapeutic exercise in the physical therapy management of a patient with lateral hip pain. **Subject:** A 53-year-old female with a 3-month history of left lateral hip pain reported increasing pain and mobility limitations. Despite a cortisone injection to the left lateral hip, she reported no change in pain and increasing difficulty with lifting her leg up to tie her shoe, walking less than 5 minutes, swimming, and riding a motorcycle with her husband for 15 minutes. The subject was not taking any medication for pain or inflammation. Radiographs of left hip were reported as normal. At baseline, Numeric Pain Rating Scale (NPRS) scores were current and best 4/10 and at worst 6/10. Self-report measures were Lower Extremity Functional Score (LEFS) 51/80, Western Ontario and McMaster Universities (WOMAC) Index 43/96, and Harris Hip Function Scale 64/100 points. Lumbo-pelvic, knee, and ankle screening examinations were unremarkable. Left hip AROM and PROM were mildly limited in all directions with capsular end feels. Left hip passive accessory movements were hypomobile with posterior, lateral, and anterior glides. Left hip manual muscle tests were normal. Pain was reproduced with the piriformis stretch position, crossing left over right leg, the FABER test position, and palpation to the lateral hip. **Methods:** The subject was seen 3 times over 4 weeks. Interventions were based on clinician assessment of impairments in PROM, end feel, and loss of passive accessory movements. The initial session consisted of hip anterior glide mobilizations followed by MWM techniques for hip flexion when impairments were still noted or unchanged. Progression of treatment was based on Global Rating of Change (GROC) score and both intrasession and intersession reassessments of function, mobility, and pain. Therapeutic exercise was prescribed based on post-intervention outcomes. **Results:** At the end of the third visit, no pain was reported with tying her shoe, swimming, walking, and riding a motorcycle. GROC was a *great deal better* indicating a clinically meaningful improvement. Left FABER and piriformis stretch positions produced 1/10 pain. Passive accessory movements were symmetrical. LEFS (62/80) and Har-

ris Hip Scale (88/100) showed clinically meaningful changes but the WOMAC did not (44/96). Telephonic contact three days after the third treatment revealed no pain or functional limitations. **Conclusion:** This case report suggests that hip mobilization combined with MWM and therapeutic exercise may reduce pain and improve function for patients with lateral hip pain. Further research is needed to investigate the effectiveness of MWM as a component of manual therapy intervention.

**MANAGEMENT OF CERVICAL RADICULOPATHY AND MUSCLE WEAKNESS USING A MULTIMODAL APPROACH OF MANUAL THERAPY, EXERCISES AND COGNITIVE BEHAVIORAL PRINCIPLES: A CASE REPORT**

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**Purpose:** To report the successful management of a patient with signs of radiculopathy of the C7 nerve root with associated triceps weakness, with an inability to tolerate traction. **Case:** Patient had 4 positive Spurling's, cervical rotation decreased to left, myotomal weakness tests indicating radiculopathy. Treatment included a multimodal approach of upper thoracic spine manipulation, repeated movements to improve centralization, active ROM, triceps strengthening and deep neck flexor retraining. The patient at evaluation presented with a FABQ in the physical activity scale of 26, hence principles of cognitive behavioral therapy were incorporated into the treatment plan. **Methods:** A 60 year old gentleman presented to our practice referred with pain in the shoulder girdle and weakness hindering use of the left upper extremity. Initial evaluation noted pain in the upper trapezius and inter scapular region at 8/10 on a visual analog scale. Physical examination revealed decreased cervical ROM in all planes. ROM was 0-60° in flexion, 0-10° in extension and 0-50° and 0-70° in left and right rotation respectively. Muscle strength in both upper extremities was unremarkable except for 3/5 in the left triceps. The

patient recorded a score of 45/80 in the SPADI functional scale, did not exhibit any UMN signs or hyper-reflexia, and had positive ULTT (Ulnar bias) in the left upper extremity. Symptoms decreased with manual traction but no change occurred with repeated movements in any plane. Treatment was initiated with mechanical traction which was easing symptoms but a recurrence of prior dizziness occurred. This was labile dizziness aggravated by any manual/mechanical application of force to the cervical region. With this restriction further treatment included seated upper thoracic manipulation and exercises to centralize symptoms, improve strength in left triceps and an aerobic program of bike riding and walking. Cognitive behavioral principles were used in view of the patient's fear of movement in all treatment procedures. The patient was encouraged to be active and fear was alleviated regarding this activity causing harm. Modalities of electrical stimulation and ultrasound were used for pain management. **Results:** The patient suffered increased symptoms with traction after the initial two sessions; following treatment interventions were modified. By the fifth session the patient reported a 50% improvement as recorded in the visual analog scale to 4/10 in his pain. At the 7<sup>th</sup> visit muscle strength had improved in the left triceps to 4-/5. Cervical side glides were started at this time with still a persistent positive ULTT. On the 12<sup>th</sup> visit pain had decreased to 3/10 and strength had increased to 5-/5 in the left triceps. The patient scored a 20/80 in SPADI and informed that he was mostly feeling close to his pre-morbid level of neck and arm symptoms. ULTT was negative at this time. At the end of all treatment the patient recorded a global rating of change of +5. **Clinical Relevance:** This case report indicates the potential for successful conservative management using a multimodal approach of manual therapy and exercise therapy for a case of cervical radiculopathy with motor involvement in the associated myotome, in combination with cognitive behavioral interventions.

**MEDICAL SCREENING AND EVACUATION: CAUDA EQUINA SYNDROME IN A COMBAT ZONE**

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**Background:** Cauda equina syndrome (CES) is a rare, but potentially devastating disorder, which is considered a true neurologic emergency. This condition often has a rapid clinical progression from other presentations of low back pain. Timely recognition of CES and surgical referral are essential to maximize functional outcomes and reduce potential long-standing neurological deficits. **Diagnosis:** A 32 year old male, U.S. Army officer, presented to a Troop Medical Clinic in Iraq with a complaint of insidious onset low back, left buttock, and posterior thigh pain. Symptoms had started 4 weeks prior with a recent, significant increase in pain level without any known injury or cause. He denied pain, numbness, or tingling distal to the knee, saddle anesthesia, or bowel and bladder changes. On exam the patient was neurologically intact throughout all lumbosacral levels with a negative straight leg raise, severely limited in lumbar flexion active range of motion, and demonstrated initial reduction of symptoms with repeated extension. He was re-evaluated day 3 and day 7 for increasing pain but was neurologically stable. On day 10 follow up, he reported a new, sudden onset of saddle anesthesia, constipation, urinary hesitancy, and right leg weakness. On exam, sensation was intact bilaterally, plantar flexion was 3-/5 on the right, the right ankle reflex was absent, and anal sphincter tone was decreased. **Results:** Due to suspected CES, the patient was evacuated to a military neurosurgeon in country and within 48 hours underwent an emergent L4-5 laminectomy and decompression secondary to a large mid-line disc herniation with an extruded fragment in the epidural space. He was returned to full military duties 18 weeks after surgery without back or leg symptoms, and with normal strength, reflexes, sensation and bowel/bladder function. **Discussion:** This case demonstrates the importance of continually medical screening for physical therapists in direct-access settings. It further demonstrates the importance of immediate referral to surgical specialists

when CES is suspected as rapid intervention offers the best prognosis for recovery.

**ORTHOPEDIC MANUAL PHYSICAL THERAPY MANAGEMENT OF A 33 YEAR-OLD FEMALE WITH A 3 YEAR HISTORY OF PROGRESSIVELY WORSENING LEFT UPPER QUARTER SYMPTOMS BEGINNING IMMEDIATELY AFTER SURGICAL CARDIAC PACEMAKER IMPLANT: A CASE REPORT**

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**Purpose:** The purpose of this case report is to describe the multimodal, Orthopedic Manual Physical Therapy (OMPT) management of a female patient presenting with a 3 year history of progressively worsening left upper quarter symptoms. **Subject:** A 33 year-old female presented to physical therapy services approximately 3 years after surgical cardiac pacemaker implant for hypocardiac issues. Upon waking from surgery, she noted symptoms in her left upper quarter region. As part of her cardiac post surgical management, she was placed in a sling and instructed not to elevate or abduct her arm greater than 80°-90° for 3-4 months. After 3-4 months, she removed the sling and resumed her usual work and recreational activities but was limited by her progressing left upper quarter symptoms. Due to the continued progressive nature of her symptoms, she sought further medical management and was referred to physical therapy. She described weakness and constant but variable pain in her left upper extremity, constant, deep pain in her left axilla, pain extending to her left lateral cervical spine, and pain in her left lower facial region. Her previous medical history was unremarkable for any of these noted symptoms prior to her pacemaker surgery. **Methods:** An impairment based musculoskeletal examination was performed. Baseline limitations in her left shoulder range of motion (ROM) and strength were noted as follows-flexion: 137°, abduction: 153°, serratus anterior manual muscle testing (MMT): 4/5. Her deep axilla symptoms were reproduced using the Upper Limb

Neurodynamic Test 1A (ULNT 1A). The following self-reported measures were recorded within the first 3 visits—Numeric Pain Rating Scale (NPRS): 6/10 for her left upper quarter region, Shoulder Pain and Disability Index (SPADI): 43.75% and the Quick Disabilities of the Arm, Shoulder and Hand (DASH): 50%. OMPT interventions included thrust and non-thrust mobilizations to her thoracic spine, left glenohumeral joint non-thrust mobilizations in and out of positions encouraging left upper extremity neurodynamic loading, left upper extremity neurodynamic mobilizations and therapeutic exercise. **Results:** The patient was seen for a total of 13 visits over a 7 week period. Her serratus anterior MMT increased to 5/5 after 5 visits. Discharge reassessment revealed no axillary, left cervical spine or facial symptoms. Left shoulder flexion and abduction ROM increased to 170° and 176° respectively without symptom reproduction. NPRS decreased to .7/10, SPADI decreased to 0% and the Quick DASH decreased to 10%. She was able to return to working and light rock climbing without issue. A 9 month reassessment revealed the following: no upper quarter symptoms, flexion and abduction ROM were 171° and 180° respectively, NPRS decreased to 0/10, SPADI remained at 0% and Quick DASH decreased to 0%. **Conclusion:** A multimodal OMPT management approach seems to have produced effective and lasting results in a 33 year-old female with a 3 year history of complex upper quarter symptoms following cardiac pacemaker surgery. **Clinical Relevance:** Future research should continue to investigate multimodal OMPT management of patients with complex upper quarter symptoms.

### THORACIC MANIPULATION IN A PATIENT WITH PRIMARY SHOULDER PAIN: A CASE STUDY

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**Purpose:** The majority of manual therapy literature to the shoulder girdle explores the influence of cervical or thoracic spine treatment when there is a concomitant complaint of spinal pain with shoulder pain. The purpose of this case study is to explore

the influence of thoracic manipulation on a patient with primary complaint of shoulder pain in the absence of cervical or thoracic symptoms. **Subject:** A single case report focusing on the manual physical therapy intervention of a 34-year-old female with subscapularis strain and anterior glenohumeral laxity. She did not report cervical or thoracic symptoms, and no spinal signs directly related to her shoulder pain were found during assessment. Initial presentation included pain in the morning reported as 8/10 lasting 20 minutes, and Quick Dash functional module score of 18.2 and a sport module score of 25. She demonstrated limitation with pain during hand behind back and elevation shoulder active range of motions (AROM). Decreased thoracic extension along with thoracic segmental hypomobility was also found during assessment. **Methods:** High velocity low amplitude posterior to anterior manipulation was performed to various levels of the thoracic spine over 5 visits. Additional treatment consisted of glenohumeral joint mobilization, rotator cuff and scapular musculature strengthening. **Analyses:** Subjective report of pain, shoulder AROM, and Quick Dash questionnaire were used to assess the effect of intervention. **Results:** This patient was seen for 8 visits over six weeks. At the conclusion of treatment she demonstrated right equal to left pain free shoulder AROM and a decrease in morning pain to 2/10 lasting only 2–3 minutes. Quick Dash measures at 1 month and 6 month follow up were zero for functional and sport modules. **Conclusion:** The effect of thoracic manipulation with this patient fostered immediate increases in AROM and was likely a component of her overall improved function. It is possible the manipulation augmented lower trapezius recruitment and enhanced scapulohumeral rhythm. The postulated theories regarding the mechanism of this effect are biomechanical, neurophysiological, or both. **Clinical Relevance:** This case report demonstrates the importance of considering the entire shoulder girdle in a patient with primary complaint of shoulder pain. Thoracic mobility can play an integral role in the recovery of a patient with shoulder pain.

### UNDIAGNOSED CHIARI I MALFORMATION IN A PATIENT STATUS POST POSTERIOR SPINAL FUSION: A CASE REPORT

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**Purpose:** Twenty-eight percent of patients with scoliosis demonstrate Chiari I malformation for which surgical treatment is recommended to halt the progression of neurological injury. The purpose of this case report is to describe a patient with scoliosis and status post spinal fusion undergoing physical therapy (PT) when presentation of fluctuating neurological responses required further medical consultation and eventual diagnosis of Chiari I malformation. **Subject:** A 16 year old female, 10 weeks status post T3-L3 posterior spinal fusion and seeking PT for lack of mobility and independence in activities of daily living, complained of post-surgical dysesthesia in her bilateral anterior thighs. She had been informed by her referring physician that this was normal. **Methods:** Neurological screenings were completed at visits six through 15, visit 17 and 19. At visit six, 19 days after her initial visit, she reported difficulty transferring out of bed and increased bilateral lower extremities (LE) dysesthesia, but did not display abnormal responses for deep tendon reflexes (DTRs), Babinski's reflexes, or clonus in either LE. At visit eight, five days later, the patient demonstrated right to left inequality of the DTRs and bilaterally positive Babinski's reflexes and clonus signs. Consultation with the orthopaedic surgeon resulted in a computed topography examination of the thoracolumbar spine that revealed no abnormal findings. At the next two PT visits, the patient persisted with left hyporeflexia and positive left Babinski's reflex and clonus sign. Constant communication with the referring medical team was maintained during the course of care with their recommendation to monitor the patient with an earlier return visit to the orthopaedic clinic. At visit 13, the patient reported she was unable to stick her tongue out straight and demonstrated tongue deviation to the left. **Results:** The referring orthopedic physician was contacted with recommendation for a neurological consultation. Magnetic

resonance imaging revealed a Chiari I malformation and the patient was scheduled for surgery. **Conclusion/Clinical Relevance:** The patient's condition changed dramatically during the course of PT with a fluctuating positive neurological examination. Consistent reassessment of these neurological signs and persistent communication with the physician facilitated the proper referral and consult for this patient. As physical therapists advocate for direct access, the ability to identify red flag scenarios, to constantly reassess a patient's changing status and to advocate for appropriate medical consultation must be demonstrated to facilitate optimal health care management.

**USE OF THRUST MANIPULATION AND NEURAL MOBILIZATION IN THE TREATMENT OF HEEL PAIN: A CASE REPORT**

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**Purpose:** To describe the examination, clinical decision making and manual therapy interventions for a patient with heel pain utilizing thrust manipulation and neurodynamic techniques. Currently there are only a few case studies in the literature, describing the utilization of neurodynamic techniques or thrust manipulation techniques in the management of patients with heel pain. None describe the utilization of both neurodynamic techniques and thrust manipulation techniques in this population. **Subject:** A 59 year old male with Parkinson's disease presented to physical therapy with a 3 month history of right heel pain. His heel pain was worse both in the morning and after driving longer than 10 minutes. He had been prescribed oral non-steroidal anti-inflammatory medications by his referring physician and attempted to manage his pain with a self directed home calf stretching program. **Methods:** Physical therapy examination revealed tenderness over the inferior/medial calcaneal region and three degrees of active ankle dorsiflexion. Reproduction of heel pain was produced with ipsilateral slump test and the introduction of great toe extension. He also presented with a manual muscle grade

of 4/5 for the ipsilateral hip abductors and extensors, and a Foot and Ankle Ability Measure (FAAM) score of 42%. Primary interventions included thrust manipulation of the talocrural and lateral midfoot joints and tibial nerve neurodynamic mobilizations. The neurodynamic mobilization directed at the tibial nerve was performed in the slump test position with great toe extension. **Results:** A near complete resolution of symptoms, a negative slump test, and a FAAM score of 94% followed 4 visits over 7 days. A telephone follow up at 9 months indicated resolution of symptoms with occasional self management strategies using a home calf stretching program. **Conclusion:** This patient experienced a rapid and clinically meaningful improvement in function with decreased pain after receiving thrust manipulation to the ankle and foot combined with tibial nerve neurodynamic mobilization techniques. **Clinical Relevance:** This case report is the first to describe the use of neurodynamic techniques combined with thrust manipulation of the ankle in the management of a patient with a primary complaint of heel pain. The treatment outlined may provide benefit for future patients with similar presentations. Future research should investigate the effects of this management strategy in a larger sample size and relative to standard care.

**USE OF THRUST AND NON-THRUST MANIPULATION FOR COSTOCHONDRITIS: A CASE SERIES**

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**Purpose:** To describe the examination and manual physical therapy interventions for patients with sub-acute/chronic episodes of recurrent upper thoracic/chest pain. The purpose is to outline the use of thrust, non-thrust mobilization/manipulation techniques combined with exercises for individuals with a diagnosis of costochondritis. **Case Description I:** A 65 year old white female presents with a diagnosis of costochondritis to PT after sustaining a sternal fracture 5 months ago in a motor

vehicle accident. She had extensive cardiac workup done to rule out cardiac issues. She received 13 sessions of treatment consisting of Rib MET's (Muscle Energy Technique), thoracic mobilization/manipulation using thrust and non-thrust techniques of T4-6 segments and scapular stabilization exercises. **Baseline Measures:** Her complaints were NPRS - 7-8/10 intermittent sharp pain, difficulty with sleeping on sides, most ADL's provoked pain at the (L) sternum and costochondral area. Her chest expansions were limited due to pain, upper chest expansion was 2 cm, mid 2 cm and lower chest 3 cm initially and her FABQ (Physical Activity Subscale) -12/24 and Work subscale - 14/42. **Final Measures:** The chest expansion measurements improved as follows: upper chest increased by 4 cm, mid chest increased by 3 cm and lower chest expansion increased by 5cm. Her NPRS -0/10 with ADL's, and while side lying NPRS - 1to 2/10. The final FABQ score, PA - 2/24 and Work - 1/42. **Case Description II:** A 70 year old white female who complained of (L) side scapular region pain which radiated to front of the chest for about a year. She had a surgical history of CABGx2, 10 years ago. She had cardiac workup done to rule out any cardiac issues and had PT for *shoulder pain* with no improvement in her condition. Patient received MET's, thoracic mobilization of T7-8 segments (grade II & III) and upper thoracic strengthening exercises. She had osteoporosis, so nonthrusting techniques were performed. **Baseline Measures:** Her (L) scapular region pain increased with bending, sitting and turning activities. Her chest expansions were limited due to pain, upper chest expansion was 1½ cm, mid 2½ cm and lower chest 2 cm initially. Her NPRS was 8-10/10 and NDI score was 28%. **Final Measures:** The chest expansions were upper chest was increased by 2½ cm, mid chest was increased by 1½ cm and lower chest expansion was increased by 2½ cm. Her NPRS decreased to 0/10 with all her ADL's. Her final NDI score was - 4% after 8 visits. **Case Description III:** A 34 year white female who works as an elementary school teacher with a diagnosis of costochondritis for 2 years was referred to PT. The patient is morbidly obese with a BMI of 43.3 (Height 5'5", Weight 260Lbs). She received thoracic manipulation in seated position, prone segmental PA mobilization

of T4–7 spinous and transverse processes and Rib MET's and upper and mid thoracic region stretching and scapular strengthening exercises for 11 visits. **Baseline Measures:** She presented with (L) costochondral region pain. Hypomobility of T5–6 segments noted. Rib dysfunction noted at ribs 4<sup>th</sup>-6<sup>th</sup> on the left side. Her chest expansion were limited due to pain, upper chest expansion was 2 cm, mid-2½ cm and lower chest 3 cm initially. The patient complained of constant dull pain which increased to sharp pain (NPRS - 8/10) with activities like deep breathing, pushing or pulling objects, and snow shoveling. Her initial NDI score was 4%. **Final Measures:** The upper chest was increased by 2 cm, mid chest by 1½ cm and lower chest expansion by 1 cm. Her NPRS was 4/10 with activities like deep breathing, pushing or pulling objects, and snow shoveling. The patient was discharged with some goals met. **Conclusion:** These patients experienced a rapid improvement in pain and function after non-thrust and thrust mobilization/manipulation and rib MET's to thoracic spine region. **Clinical Relevance:** A combination of thrust and non-thrust mobilization/manipulation, rib MET's and scapular strengthening exercises may be helpful for patients with a diagnosis of costochondritis.

**SURGICAL AND THERAPEUTIC MANAGEMENT OF A COMPLETE PROXIMAL HAMSTRING RUPTURE AFTER FAILED CONSERVATIVE APPROACH**

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**Purpose:** The purpose of this case report is to describe the physical therapy post-operative management of a patient with a complete rupture of the proximal insertion of the hamstring and subsequent reconstruction. Conservative management of this

rare condition has traditionally focused on end-range passive stretching, modalities, and direct hamstring strengthening. New evidence has suggested a change to a program that is more protective of the injured tissue and inclusion of exercises such as core stabilization and indirect hamstring strengthening. **Case Description:** The patient was a 24 year old female coach who sustained a complete avulsion of the proximal hamstring tendon while playing softball. The patient underwent a hamstring reconstruction using an Achilles tendon allograft. Strict precautions concerning range of motion and stretching, weight-bearing status, and brace protocol were followed to protect the surgical graft. Progression of treatment incorporated cardiovascular exercise, strength and proprioception exercises, and progressed with the focus on correct movement patterns and muscle absorption during functional movements. **Outcomes:** The patient attended 25 sessions over seven months. The pre-surgical muscle weakness improved from 4/5 to 5/5. Straight leg raise range of motion improved from 145° of abnormal hip flexion to 90° in the supine position. Lower Extremity Functional Scale (LEFS) scores improved from 15/80 to 70/80. At 7 months after surgery, the patient scored 18/21 on the sport cord test (developed by Steadman Hawkins Clinic and Howard Head Sports Medicine). **Conclusion/Clinical Relevance:** Conservative management has traditionally focused on end-range passive stretching, modalities, and direct hamstring strengthening. In this single example, a protective approach was associated with a positive outcome at the 7 month follow up. The effects of proximal lower extremity and abdominal muscles on the pelvis, in terms of flexibility and neuromuscular control, are important in maximizing return to sport function for patients with hamstring injuries. It is evident from the literature that a rehabilitation protocol for hamstring injuries which focuses on early movement and neuromuscular control can dramatically reduce hamstring re-injury rates compared with a traditional stretching and strengthening approach. Information from this case may be useful as there is limited research available on the rehabilitative treatment of hamstring avulsions. Future research to establish a scientifically based rehabilitation protocol for the treatment of hamstring avulsion injuries is suggested.

**THE EFFECT OF L-MODIFIED LOW-DYE TAPING ON FOOTPRINT ANALYSIS USING A PRESSURE SENSING SYSTEM: A PILOT STUDY**

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**Purpose:** The purpose of this research study was to describe the L-Modified Low-Dye taping technique and determine its impact on footprint analysis using a pressure sensing system. **Subjects:** Eight subjects (mean age 26.5 ± 3.1 yrs) who were asymptomatic and exhibited an excessively pronated foot defined by three mandatory criteria: noticeably everted calcaneous, a medial bulge at the talonavicular joint, and a low medial longitudinal arch (navicular drop >10 mm) were included in this study. **2–4s:** Plantar pressure measurements were obtained using the GAITRite™ system walkway. Subjects performed three walks for each condition (barefoot and taped) across the pressure sensing walkway at their self-selected cadence. **Taping Technique:** The subject was placed in long sitting position with the lower leg supported by the table. Transverse strips of permeable adhesive gauze were applied from the medial to lateral border of the plantar surface of the foot beginning at the level of the metatarsal heads and ending prior to the heel. The foot was placed in subtalar joint neutral position and the first ray was placed in slight active plantar flexion to pronounce the medial longitudinal arch. Using brown rayon-backed tape with zinc oxide adhesive, a strip of tape was applied using a strong oblique pull beginning from the lateral aspect of the fifth metatarsal head across the plantar surface of the foot and ending at the medial aspect of the heel superior to the talocalcaneal joint. A second strip of tape was applied using a strong oblique pull beginning from the lateral aspect of the heel, superior to the talocalcaneal joint, across the plantar aspect of the foot and ending at the medial aspect of the first metatarsal head. Three to four transverse strips were then applied to support the medial longitudinal arch, beginning on the rearfoot and moving towards the forefoot overlapping a third of the preceding strip until reaching the first cuneiform while using a strong supinatory pressure. Two closing strips were applied

to cover the loose ends of the tape on the medial and lateral surfaces of the foot making sure not to cross the heel. **Analyses:** The GAITRite™ system software utilized special algorithms to geometrically divide the footprint into 12 trapezoids for analysis. Average peak plantar pressures for each trapezoid were calculated for both conditions and compared using single tailed t-test ( $p < .05$ ). **Results:** With 95% confidence this research suggested that the L-Modified Low-Dye taping technique significantly decreased average peak plantar pressures at the medial arch ( $p=.001$ ), lateral metatarsal heads ( $p=.001$ ), and the great toe ( $p=.003$ ) without significantly increasing average peak plantar pressure measurements at any other plantar surface. **Conclusions/Clinical Relevance:** This preliminary data suggests that the L-Modified Low-Dye taping technique can be utilized to decrease medial plantar pressures and diminish the collapse of the medial longitudinal arch of the foot. This taping technique may be useful as a diagnostic tool for orthotic prescription and a secondary intervention in conjunction with manual physical therapy. In addition, the research methodology may be useful to study the impact of manual physical therapy on plantar pressures of the foot. More investigation is needed to observe the cause and effect relationship of this taping technique on a symptomatic patient population receiving manual physical therapy as well as plantar pressure changes during and after a period of prolonged application.

**A COMBINED MANUAL THERAPY AND PAIN EDUCATIONAL TREATMENT APPROACH OF A PATIENT WITH ELEVATED PSYCHOSOCIAL VARIABLES AND PERSISTENT NECK PAIN: A CASE REPORT**

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**Purpose:** Whiplash associated disorder (WAD) is a multifactorial condition involving both physical and psychosocial components. It has been reported 60% of those persons who have suffered a motor vehicle crash (MVC) continue to have mild residual pain after *recovering* from their original injury. Currently no published literature exists describing an assessment and treatment strategy for a subgroup of patients presenting with non-traumatic mechanical neck pain and signs and symptoms of post-traumatic stress that may be due to what was considered a recovered WAD. The purpose of this case is twofold; 1) to describe the multimodal assessment and treatment approach for an individual presenting with what appeared to be an insidious onset of neck pain, and 2) to establish preliminary methods aimed at identifying a potential subgroup of patients with a previous history of whiplash presenting with what may be considered a recurrence of their original whiplash symptoms (e.g. mechanical neck pain, motor control impairment and psychological distress). **Subject:** A 37 year-old female presented to physical therapy with a complaint of an insidious onset of neck pain and persistent symptoms for the last 21 days. Self-reported measures indicated the presence of elevated psychosocial variables and further questioning revealed a previous history of a traumatically induced WAD 18 years ago. **Methods:** An impairment based musculoskeletal examination

was performed and the following self-reported measures were recorded at baseline: Numeric Pain Rating Scale (NPRS) 6.3/10, Neck Disability Index (NDI) 56% (56/100), Impact of Events Scale (IES) 34/75, Fear-Avoidance Belief Questionnaire (FABQ-PA) 21/24, and the Patient Specific Functional Scale (PSFS) 6.3/10. Primary interventions included thrust and non-thrust mobilizations to the thoracic and cervical spine in addition to therapeutic exercise. Secondary interventions included a pain neurophysiological based education approach and graded movement. **Results:** Essentially symptom free following seven treatments over the course of 12 weeks. Changes at discharge were reported as follows: NPRS 6.3/10 to 1.7/10, NDI 56% to 0%, IES 34/75 to 5/75, FABQ-PA 21/24 to 0/24, and the PSFS 6.3/10 to 9.7/10. She continued to be relatively symptom free at a 4- month follow up. **Conclusion:** Manual therapy and a pain educational treatment approach with graded movement appeared to be effective in resolving her symptoms. **Clinical Relevance:** This case report is the first to use the IES as a screening tool for an individual with a non-traumatic neck pain episode that may have been influenced from a previous history of WAD. Clinical examination of patients with mechanical non-traumatic neck pain should aim to identify any previous history of traumatic neck injury (such as MVC) including the use of the IES aimed at the identification of psychosocial variables that have shown to impact outcomes. Future research should investigate the potential existence of a sub-group of patients presenting with non-traumatic mechanical neck pain with a previous history of head and or neck trauma.

**THORACIC SPINE  
MANIPULATION, EXERCISE,  
AND PATIENT EDUCATION  
ON TWO PATIENTS WITH  
CERVICOGENIC HEADACHES:  
A NOVEL APPLICATION OF  
CLELAND'S DEVELOPMENTAL  
CLINICAL PREDICTION RULE  
FOR GUIDING TREATMENT OF  
A SUBGROUP OF PATIENTS  
WITH NECK PAIN**

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**Study Design:** Retrospective two patient case series. **Literature Review and Purpose:** Neck pain is commonly treated with outpatient physical therapy (PT). Cleland developed a clinical prediction rule (CPR) to guide the treatment of neck pain using thoracic spine manipulation, exercise and patient education. Cervicogenic headaches (CGHA) are also commonly treated with outpatient PT and are associated with neck pain complaints 50% of the time. Treatment of CGHA combining manual therapy and exercise yielded better results than manual therapy or exercise alone. Evidence specifying particular manual PT techniques for CGHA is sparse and when present treatment is commonly directed to the upper cervical spine. Little evidence suggests manual therapy directed at the thoracic spine (TS) will benefit a patient with CGHA. The purpose of this case series is to describe treatment of CGHA guided by Cleland's developed CPR for neck pain using the specific manual therapy technique of TS manipulation, exercise, and patient education. **Case Description:** Two female patients were referred for treatment of headaches and neck pain. The PT clinically diagnosed both patients with CGHA using the International Headache Society criteria. Patient #1 was a 51 year old woman with unilateral right facial pain. Her neck disability index (NDI) was 10% and numeric pain rating scale (NPR) was 0/10 with worst pain at 9/10. Headaches started insidiously and occurred 2 times a day for the last 6 months. No previous management. Patient #2 was a 43 year old woman with neck pain and unilateral right head-

aches. Her NDI was 26% and NPR was 5/10 with worst pain at 9/10. Headaches started insidiously and have occurred daily for 6 months. She managed with Aleve as needed. Both patients met 2 or more criteria for Cleland's CPR for neck pain. The therapist hypothesized the post test probability using Cleland's developed CPR application could yield a benefit and opted to treat using TS manipulation. **Outcome:** Patient #1 was treated 3 times and reported no HA and an NDI of 4%. Both patients were taught self management. Patient #2 was treated 4 times and reported no HA, no Aleve and a NDI of 5%. **Clinical Relevance and Discussion:** Two CGHA patients appeared to benefit from classification and treatment based on Cleland's CPR for neck pain. Both patients reported a change in NPR beyond the minimally clinically important difference (MCID) on the NPR scale. Patient #1's NDI did not exceed the MCID, but patient 2's NDI changed beyond the MCID. Limitations in this case series prevent a conclusive causal relationship of treatment and outcome. However it is possible a subgroup of patient with CGHA may benefit from the application of Cleland's developed CPR for neck pain. **Conclusion:** Two patients with CGHA benefited from classification and treatment using Cleland's developed CPR for neck pain.

**CERVICOTHORACIC  
MANIPULATION AND KNEE  
EXTENSION DURING THE SLUMP  
TEST: A CASE REPORT**

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**Purpose:** To date few studies have examined the effectiveness of manual therapy in the management of patients with nonspecific low back pain and positive slump tests. Additionally, there currently exists no consensus for the most efficacious treatment for neuropathic pain. The primary purpose of this case report was to describe the management of a patient presenting with clinical findings indicative of neuropathic low back pain using thoracic thrust manipulation, slump stretching, and core stability exercises. The secondary purpose of this case was to examine if thoracic thrust manipulation had an immediate effect on knee

extension during the slump test. **Subject:** A single patient referred to physical therapy with a 20 year history of low back pain and a recent worsening of symptoms over the past 6 months. An impairment based exam revealed hypomobility of the cervical and thoracic spine and positive neurodynamic tests with symptom reproduction and limited knee extension during the slump test. **Methods:** This patient received cervical and thoracic thrust manipulation using an impairment based model. Other interventions included slump stretching and low load core stabilization exercises. Outcome measures collected during each treatment session included pain and knee extension range of motion (ROM) during the slump test immediately before and after spinal manipulation. Pretest and posttest knee extension ROM were compared with a nonparametric paired sign test using a binomial distribution. The modified Low Back Pain Disability Questionnaire (LBPdq) was measured at visits 1, 4, and discharge. **Results:** This patient was treated once weekly for 7 weeks and demonstrated clinically meaningful improvements in all outcome measures. At the 4<sup>th</sup> visit, the modified LBPdq increased from 16% to 20%. However by discharge, the modified LBPdq decreased to 8% which satisfied the 8% MCID. At each session, knee extension ROM change during the slump test surpassed the standard error of the mean (1.2°-1.4°). The mean change in ROM before and after each manipulation was 8° bilaterally (SD 3.3°-3.9°). The mean decrease in pain associated with the increased knee extension ROM was 2 points (SD 0.88 points). A nonparametric paired sign test showed a significant difference in knee extension and a significant decrease in pain during the Slump test pre-and post-manipulation (k=8, p< 0.0039). **Conclusion:** Management with cervicothoracic manipulation and slump stretching in this patient with mechanosensitivity yielded significant changes in pain and knee extension range of motion during the slump test. Whilst immediate effects may be related to manipulation, overall effects can not be extrapolated to the general population from a case report. **Clinical Relevance:** Manual therapy, slump stretching, and low load core stabilization are viable treatment options in patients with neuropathic pain. Further studies should investigate the effec-

tiveness of manual therapy in a population with neuropathic pain.

### THRUST AND NON-THRUST TRACTION MANIPULATION IN THE MANAGEMENT OF CERVICAL RADICULOPATHY: A CASE REPORT

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**Purpose:** To describe the clinical management of an initially non-responsive presentation of acute cervical radiculopathy, with first non-thrust traction manipulation with neural mobilization, then thrust traction manipulation with neural mobilization. **Case Description:** 44 year-old female with two weeks severe neck and right arm pain radiating to approximately six inches above the wrist. Presentation was consistent with right C5 radiculopathy, referred with dorsal scapular nerve impingement with cervical myopathy. Baseline measures included a disability of arm shoulder hand (DASH) index of 28% and a numeric pain rating scale (NPRS) score of 10/10. First four visits comprised evidence based treatment for cervical radiculopathy including lateral cervical glides with neural mobilization, traction and thoracic thrust manipulation. Secondary to lack of progress, and assessed clinical impairments, traction gapping manipulation of the cervical spine in combination with neural mobilization was completed for two visits. With clinical progression initial treatments were re-introduced for the last two sessions. At the fourth visit neck disability index (NDI) score of 18%, and a magnetic resonance image (MRI) report of a severe right foraminal stenosis of C4/5 was received prior to the fourth session. **Results:** Nocturnal symptoms significantly decreased post visits five and six. Discharged after eight sessions, NDI 0%, DASH 0%, and NPRS 0%. Follow up MRI at three months showed no change in pathoanatomy at any cervical level. Patient was symptom free at six months, minimal cervical motion restriction without significant functional restrictions reported at twelve months. **Conclusions:** The utilization of

thrust high-velocity low amplitude cervical traction manipulation, in combination with neural mobilization, following non-response to best evidence interventions for cervical radiculopathy, led to complete symptom resolution. **Clinical Relevance:** No cause and effect can be established by this case report, but the unique combination of manual physical therapy techniques described, offers the potential for further options in impairment based management of patients with non-responsive cervical radiculopathy.

### THE LONG-TERM EFFECTS OF A NEURODYNAMIC TREATMENT TECHNIQUE USING A TREATMENT-BASED CLASSIFICATION APPROACH TO LOW BACK PAIN: A CASE REPORT

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**Purpose:** To describe the long-term effects of a neurodynamic treatment technique for a patient with non-specific low back pain (LBP) and lower extremity (LE) pain who met 3 out of 5 criteria for the lumbopelvic manipulation classification (although outside of the reported age range from the initial and validation CPR studies). The relevance of neurodynamics has received little attention in the literature on matching subgroups of patients with LBP to intervention. **Subject:** An 85-year-old female presented to physical therapy with a primary complaint of insidious onset LBP radiating to the left posterolateral thigh. Symptom duration was approximately 1 year and affected the patient almost daily. Key physical examination findings included lumbar spine hypomobility, 35° hip internal rotation range of motion (ROM) bilaterally, no symptoms distal to the knee, and lower quarter neural tension dysfunction (+ Straight Leg Raise (SLR) at 40° and + Slump Test). **Methods:** The subject attended 7 PT sessions over 4 weeks and completed the Modified Oswestry Low Back Pain Disability Questionnaire (ODI) at baseline (42%) and every other subsequent visit. Telephone follow-up was conducted at 10 months. An impairment-based treatment approach was implemented addressing lumbopelvic and hip restrictions and was supplemented with

a home exercise program (HEP) aimed at ROM limitations, targeted muscle stretching, and core stabilization exercises. By visit 4 the ODI decreased to 36% and symptom resolution had plateaued. At visit 5 a neurodynamic treatment technique was introduced. With the patient in a supine position, the involved LE was raised in a SLR testing position (biased with hip adduction and internal rotation) until initial onset of discomfort. At that point, passive dorsiflexion of the ipsilateral ankle was performed, holding the end-range position 3–4 seconds, followed by a rest (plantarflexed) position of equal duration. Ten repetitions of this maneuver were performed. The patient was instructed in a similar self-treatment technique that was included in the HEP. **Results:** At visit 7 the ODI was 18%, a 58% improvement over the initial score. The patient also reported a marked decrease in the frequency of symptoms, had met all initial treatment goals, and was therefore discharged. These results were maintained at 10-month follow-up, with symptom frequency reportedly 2 times per month (versus 5 out of 7 days on initial presentation) and 18% on the ODI. **Conclusion/Clinical Relevance:** This case study suggests that neurodynamic treatment techniques may be useful in treating patients with low back and lower extremity pain who present with neural tension dysfunction. While this individual did not resemble subjects in the studies by Flynn et al and Childs et al in terms of age or duration of symptoms, physical examination findings and a *best fit* application of the classification system placed her in the manipulation subgroup. However, symptoms did not resolve substantially until introduction of a neurodynamic treatment technique. In a study by Cleland et al another neurodynamic treatment technique, slump stretching, was shown to be effective in the management of patients with non-radicular LBP when combined with lumbar mobilization and exercise. Further research is needed to determine whether neural tension dysfunction represents an impairment or distinct subgroup in the treatment classification system for patients with LBP.

## USE OF MANIPULATION IN A PATIENT WITH ACUTE LOW BACK PAIN WITH RADIATING SYMPTOMS AND A HISTORY OF SPONDYLOLISTHESIS: A CASE STUDY

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**Purpose:** To describe the clinical decision-making process and manual physical therapy management of a patient with acute low back pain (LBP), bilateral lower extremity (LE) symptoms, and a history of spondylolisthesis. **Background/Significance:** Current evidence suggests that manipulation may be beneficial in the treatment of acute low back pain, but very little evidence exists to guide physical therapy management of spondylolisthesis, especially in the presence of radiating symptoms. **Subject:** The patient was a 38 year-old female with 2 week history of LBP and 2 days of bilateral radiating symptoms. She described an episode of LBP and bilateral LE symptoms 22 years prior, with a radiographically verified grade I spondylolisthesis at that time. The patient achieved full recovery of symptoms after receiving physical therapy interventions, and she was symptom free for 10 years. At that time, she had a recurrence of her previous symptoms (LBP, bilateral LE symptoms) that resolved slowly after resuming her previously prescribed exercise program. Since that time she has had 2 other episodes, the most recent one occurring 2 weeks prior to coming to physical therapy. With this latest episode, the leg symptoms had disappeared after 2 days, and she presented to physical therapy with her familiar central LBP and a new onset of left sacroiliac region symptoms. **Examination:** The initial Oswestry score was a 38%, the fear avoidance beliefs questionnaire work subscale (FABQW) was an 11, and the physical activity subscale (FABQA) was a 12. Her lower quarter screening exam revealed the following: bilateral knee jerk 3+ and ankle jerk 2+, intact sensation to light touch L4-S2, impaired sharp/dull sensation around the lateral calcaneus bilaterally and

the medial calcaneus on the left. Myotomal testing revealed 4/5 hamstrings bilaterally, ankle inversion 4+/5 bilaterally and extensor hallucis longus 4+ bilaterally. She also presented with positive thigh thrust, posterior shear, Gaenslen's and sacral thrust for reproduction of her new onset left sided sacroiliac region pain. The history and physical examination revealed that the patient met the criteria for both the lumbopelvic manipulation and stabilization clinical prediction rules. Specifically, she presented with all 5 of the clinical predictors for success with manipulation (a symptom duration of 14 days, no pain currently below the knee, hip internal rotation > 35°, a low FABQW and hypomobility at L2,3,4) and 3 of the predictors for success with stabilization (positive prone instability test, age <40 and the presence of aberrant movements with lumbar movements). **Interventions:** The decision was made to proceed with treatment from both the manipulation classification and the stabilization classification. The patient was treated with a lumbopelvic manipulation to the left (most symptomatic) side which resulted with immediate reduction in resting pain from a 5/10 to a 1/10 as well as full forward flexion without aberrant movements. The patient was also trained in transversus abdominis isometrics, pelvic clock exercises and gentle pelvic tilts avoiding end range anterior tilt. She was also encouraged to remain active within pain tolerance and avoid positions of lumbar extension that aggravated her LBP. At the second visit her Oswestry had improved to a 24%. She was again treated with manipulation, and her spinal stabilization exercises were progressed. Following the second session, manipulation was discontinued and she was treated 4 more times for a progression of her home exercise program, which mainly focused on lumbar stabilization training, exercise, and overall lower quarter strengthening. **Outcomes:** The patient was seen for 6 visits over the course of 30 days. Her final Oswestry score after 6 visits was a 14%, and at a 6 month follow up she had not experienced a recurrence to that point and her Oswestry score was a 10%. **Conclusions:** Clinical decision making in the presence of ambiguity can be difficult. We report on a patient that presented with many examination findings that are purported to predict success with both lumbopelvic manipulation and stabi-

lization. However, the clinical prediction rule studies did not include patients with positive neurologic findings, and therefore it is unknown whether the findings from these studies could or should be generalized to a patient like ours. In this case, manipulation followed by stabilization was used safely and effectively in a patient with a diagnosed spondylolisthesis. While stabilization has been shown to improve outcomes in patients with spondylolisthesis, further research is needed to determine the role of manipulation in the management of these patients.

## EFFECTS OF MANUAL PHYSICAL THERAPY AND EXERCISE IN MILD HALLUX VALGUS: A SINGLE SUBJECT DESIGN

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**Background:** Hallux valgus (HV) occurs in one-third of Western society and has been associated with shoe wear, in particular high heeled shoes. HV has been linked to functional deficits in the elderly including increased falls risk. Conservative management of HV including orthotics and splinting is not supported in the literature. A major component of conservative care is education in lifestyle changes including the recommendation that women no longer wear high heeled shoes. A recent pilot study demonstrated improvement in function and pain related to HV with the combination of cryotherapy and a conservative protocol of mobilization and manipulation in symptomatic HV; this treatment was in combination with lifestyle changes. The purpose of the study was to determine whether manual physical therapy (MPT) and exercise provide pain relief and improved function (including an individual's perception of improved function) without including education in changing shoe wear habits as an intervention. **Methods:** A single subject meeting the diagnostic criteria for HV was recruited. **Procedures:** The design of this study is a single subject design (N of 1) A-B-A Design: A—Baseline, 1 week without intervention, B—Six week intervention phase, A—Final reassessment, 1 week post intervention. Out-

come variables include the Numeric Pain Rating Scale (NPRS), the Patient Specific Functional Scale (PSFS), and the Foot and Ankle Ability Measure (FAAM). The NPRS reported is an average of current, worst and best pain level over a 24 hour period. The PSFS included the following goals: wearing high heels for two hours without pain, working a full day without pain, hiking for two hours without pain. **Results:** The subject experienced a clinically significant improvement in FAAM activities of daily living subscale and the PSFS scale. The NPRS during treatment increased but not to the level of clinical significance. The patient experienced an improvement in NPRS by the 1 week follow-up measurement (0.67/10) however this did not reach clinical significance. **Discussion:** NPRS at 1 week follow-up did not reach clinical significance because reduction of the original NPRS score was less than two points. This could be due to a floor effect because when treatment was initiated the subject had a low starting NPRS (1/10). Lifestyle modification was not included as an intervention, which could have limited the results. In addition to the lack of lifestyle modification the subject chose high heel shoe wearing as a goal on the patient specific functional scale; high heeled shoe wear has been associated with the presence of HV. **Conclusion:** Manual PT and exercise for the treatment of mild hallux valgus may provide a clinically important difference in function however further research is needed to determine statistical significance.

**CLINICAL DECISION MAKING ASSOCIATED WITH AN UNDETECTED ODONTOID FRACTURE IN AN OLDER INDIVIDUAL REFERRED TO PHYSICAL THERAPY FOR THE TREATMENT OF NECK PAIN: A CASE REPORT**

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**Purpose:** This report describes the examination of and decision-making process for a patient referred to physical therapy for the treatment of neck pain following trauma who had an underlying odontoid fracture that precluded physical therapy intervention. **Subject:** This case involved a 73-year-old woman who had a sudden onset of neck and left upper extremity pain after a fall 15 days prior to her initial physical therapy visit. **Methods and Analyses:** Conventional cervical spine radiographs completed 1 day prior to her initial physical therapy visit were negative for a fracture. However, several components of this patient's history and physical examination were consistent with a condition for which physical therapy intervention would not be indicated until more definitive cervical spine diagnostic imaging had been completed; more specifically, the physical therapist was primarily concerned about the possibility of an undetected fracture. The patient was an older woman previously diagnosed with osteoporosis who reported a history of trauma to her cervical spine region 15 days prior that continued to cause significant pain in the cervical region and left upper extremity. The patient complained of pain that was constant in nature and worst at night, which caused significant difficulty sleeping. The patient also had significantly limited active cervical spine range of motion and significant midline palpatory tenderness throughout the cervical spine. Furthermore, upon review

of the radiographs by the physical therapist which were completed 1 day prior, it was noted that the radiographic images were generally underexposed, which may not allow for adequate interpretation. **Results:** The referring physician was contacted and immediate magnetic resonance imaging was requested which revealed a type II fracture of the odontoid. Thirty-four days after her fall, the patient underwent a C1-C2 fusion. **Conclusion/Clinical Relevance:** When evaluating patients with neck pain who have a history of cervical spine trauma, it is important that physical therapists understand the clinical findings associated with cervical spine fractures, as these findings provide guidance for the use of cervical spine diagnostic imaging and medical referral prior to implementing physical therapy interventions. In this patient, a history of a fall, age greater than 65 years, severe neck pain which was worst at night, and significant pain with midline cervical spine palpation lead to the suspicion of an undetected fracture despite a negative initial radiographic report. This suspicion led to the physical therapist contacting the referring physician to suggest the need for additional diagnostic imaging studies that confirmed a fracture of the odontoid.

**REHABILITATION OF AN EX-PROFESSIONAL BALLET DANCER FOLLOWING TWO FAILED ARTHROSCOPIC SURGERIES OF THE HIP: A CASE REPORT**

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**Background:** Hip pain is a common complaint amongst professional dancers. A recently recognized source of pain is intra-articular impingement disorders involving the labrum. These conditions are generally not successfully treated with physical therapy often necessitating arthroscopic surgical intervention. The purpose of this case report is to describe the physical therapy evaluation and treatment of a dancer who had undergone two failed arthroscopic surgeries for right hip impingement. **Case Description:** The patient was a 34 year old female ex-professional dancer who was referred to physical therapy (PT) for per-

sistent pain and disability following her second unsuccessful arthroscopic surgery to her right hip. Her first surgery was for a suspected labral tear 6 months prior but this surgeon could not identify a labral tear or any other pathology to excise during this hip arthroscopy. Following this procedure she had 3 months of PT including manual therapy but overall symptoms did not resolve. She had undergone a second hip arthroscopy consisting of a synovectomy, resection of excessive impinging femoral head-to-neck bone, and resection of a soft tissue cyst. She arrived at our clinic 3 ½ weeks after this second procedure reporting that this procedure had failed since her pain had not improved. The patient's main complaints were right groin pain (3/10 on the numeric pain rating scale) that was worse with walking, sitting, crossing her legs and inability to return to dancing. On physical exam, she demonstrated a sway back posture, limited right hip flexion and internal rotation, decreased gluteus maximus strength, a tight right iliotibial band, and during an active straight leg raise the greater trochanter was perceived on palpation to move in an anterior direction. Interventions focused on improving the anterior to posterior glide of the right femur, strengthening the iliopsoas, and decreasing the amount of hip hyperextension and medial rotation with motor control exercises. Additional interventions included anterior to posterior (AP) and inferior hip joint mobilizations. She was seen for a total of 13 treatments. **Outcomes:** Her score on the modified Harris hip score improved from 49.5 (poor) to a 75.9 (fair outcome) at 12 visits and then to 81.4 (good) at a follow up of 9 months. Her Lower Extremity Functional Scale score improved from a 41/80 to a 53/80. Her global rating of change improved to a +4 or moderately improved. In addition, her score on the Physical Functioning subscale of the SF-36 improved from a 31.8 to a 42.3. **Discussion:** We propose that for successful treatment of femoroacetabular impingement, a clinician should consider the benefits of combining manual therapy with specific exercises to control femoral glide. Hip joint mobilization seemed to help this client the best with pain management and the specific exercises seemed to reinforce correct movement patterns and helped to maintain her functional gains.

**MANUAL PHYSICAL THERAPY  
DIFFERENTIAL DIAGNOSIS  
AND INTERVENTION FOR LOW  
THORACIC PAIN IN AN 18-YEAR-  
OLD MALE ATHLETE:  
A CASE REPORT**

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**Purpose:** The purpose of this case study is to describe the examination, differential diagnosis, manual physical therapy interventions, and outcomes for an 18-year-old athlete with chronic lower thoracic pain.

**Subject:** The 18-year-old male athlete sustained a traumatic weight-lifting injury while participating in organized high school athletics. He initially had an acute episode of constant pain that lasted for several weeks. The symptoms improved slightly, but he still suffered from constant pain. Eleven months later, he was seen by his family physician and then referred to an orthopaedic surgeon. Imaging obtained at this point identified several abnormalities of the spine, but they were non-specific when interpreted separately. The patient was subsequently referred to physical therapy. The patient discontinued physical therapy secondary to lack of improvement after 2 months. For the next 6 months, the patient had constant pain with all activities, especially during prolonged standing or sitting. Twenty-one months after the initial injury, the patient presented to a direct access setting with all diagnostic imaging. **Methods:** Single case report design. **Analyses:** Use of patient reported functional index scale (modified Oswestry back pain disability questionnaire) and numerical pain rating scale at initial examination, through the course of treatment, and at discharge. **Results:** The patient reported no pain after eight physical therapy treatments over two and a half weeks and a 0% modified Oswestry disability score; all goals were achieved. The patient was able to return to full function and activity. At a 10 month telephone follow-up, the patient remains symptom free. **Conclusions:** This case report suggests that thoracic manual physical therapy spinal manipulations, myofascial mobilizations, trigger point release, and core stabilization and flexibility exercises may have been beneficial in reducing pain and restor-

ing function in this patient. **Clinical Relevance:** To date, there have not been any studies that have analyzed the differential diagnosis of an adolescent male, with possible thoracic spine compression fractures and possible Scheuermann's disease, and the subsequent successful return of full function. The literature is quite vague regarding the diagnostic criteria of Scheuermann's disease, but it is thought to be quite prevalent. It is also thought to be a significant cause of back pain in adolescents. While surgical correction has been recommended in the literature for severe cases, conservative treatment has not been addressed, other than stretching. This case report may suggest that thoracic spine manual physical therapy manipulations, myofascial mobilizations, trigger point release, stretching, and core stabilization exercises may have been beneficial in reducing pain and restoring function in this patient.

"The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the US Air Force or Department of Defense."

**INTERVENTION FOR  
CERVICOGENIC HEADACH:  
CASE REPORT WITH 15-MONTH  
FOLLOW-UP**

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**Purpose:** Physical therapists are often faced with small windows of opportunity to treat patients prior to their prolonged absence from the local area. This case describes the three treatment sessions of a patient with chronic cervicogenic headaches over an eleven day period. **Case Description:** The patient was a 17 year old female with a 15-month history of right-sided suboccipital, occipital and frontalis headaches not present prior to a MVA in October 2005. She presented as a direct access patient on January 2007, reporting a frequency of three to five headaches per week causing significant interruption in her sleep and ADLs. Treatments had been received from her pediatrician, neurologist and cardiologist that were

primarily pharmacological in nature. The patient and her parents reported no significant relief with these treatments. A family vacation was planned in two weeks. Neck Disability Index (NDI) score was 69% and Numeric Pain Rating Scale (NPRS) average score was 6.6. Cervical AROM demonstrated limitations in extension (29°), right rotation (45°) and left rotation (30°)—with increased pain intensity of headache-type symptoms with measurement. Tightness was found in the suboccipital musculature, right levator scapula, right scalenes, and bilateral upper trapezius. Hypomobility was found at C0-C1 bilaterally and C1-C2 into left rotation. Cranio-Cervical Flexion Test (CCFT) Performance Index was 10 (10mmHg increase from 20mmHg for one repetition). **Results:** The patient was treated with muscle energy technique (MET) at CO-C1 and C1-C2. Reassessment demonstrated reduction of headache (VAS 1/10),

increased cervical AROM (extension 67°, right rotation 75°, left rotation 73°) and an improved CCFT Performance Index of 60 (10mmHg increase from 20mmHg for six repetitions). The patient was provided with a prone chin-tuck on a towel roll as a HEP. She returned two days later and reported no headaches since her treatment. NDI was 9% and NPRS was 0.66. Cervical AROM extension (63°), right rotation (74°) and left rotation (73°) were all without pain. Assessment of her left CO-C1 demonstrated slight hypomobility and was treated with MET. No other dysfunctions were noted. Patient was seen at eleven days post-evaluation for re-assessment. NDI was 2% and NPRS average was 0. Her cervical AROM was WNL and CCFT Performance Index had increased to 80. She was asked to return for follow-up after her vacation but she failed to show. A follow-up was performed 15 months later during which the patient

reported she had not had any headaches since last being seen. Assessment revealed cervical AROM WNL, no muscle tightness or dysfunctions in the cervical area, NDI score of 0% and CCFT Performance Index of 100. **Clinical Relevance:** While a similar case study involving manual therapy for cervicogenic headaches has been reported, this case is different in that the window for intervention was considerably shorter and the interventions were isolated to the suboccipital region. The patient's increase in the CCFT Performance Index in the short-term may indicate that MET applied at CO-C2 has a facilitatory effect on the deep cervical flexors similar to that of how HVLA at the SIJ has been shown to facilitate transverse abdominis activation. The efficacy of MET in the treatment of cervicogenic headaches and its possible influence on the activation of the deep cervical flexors warrants further investigation.