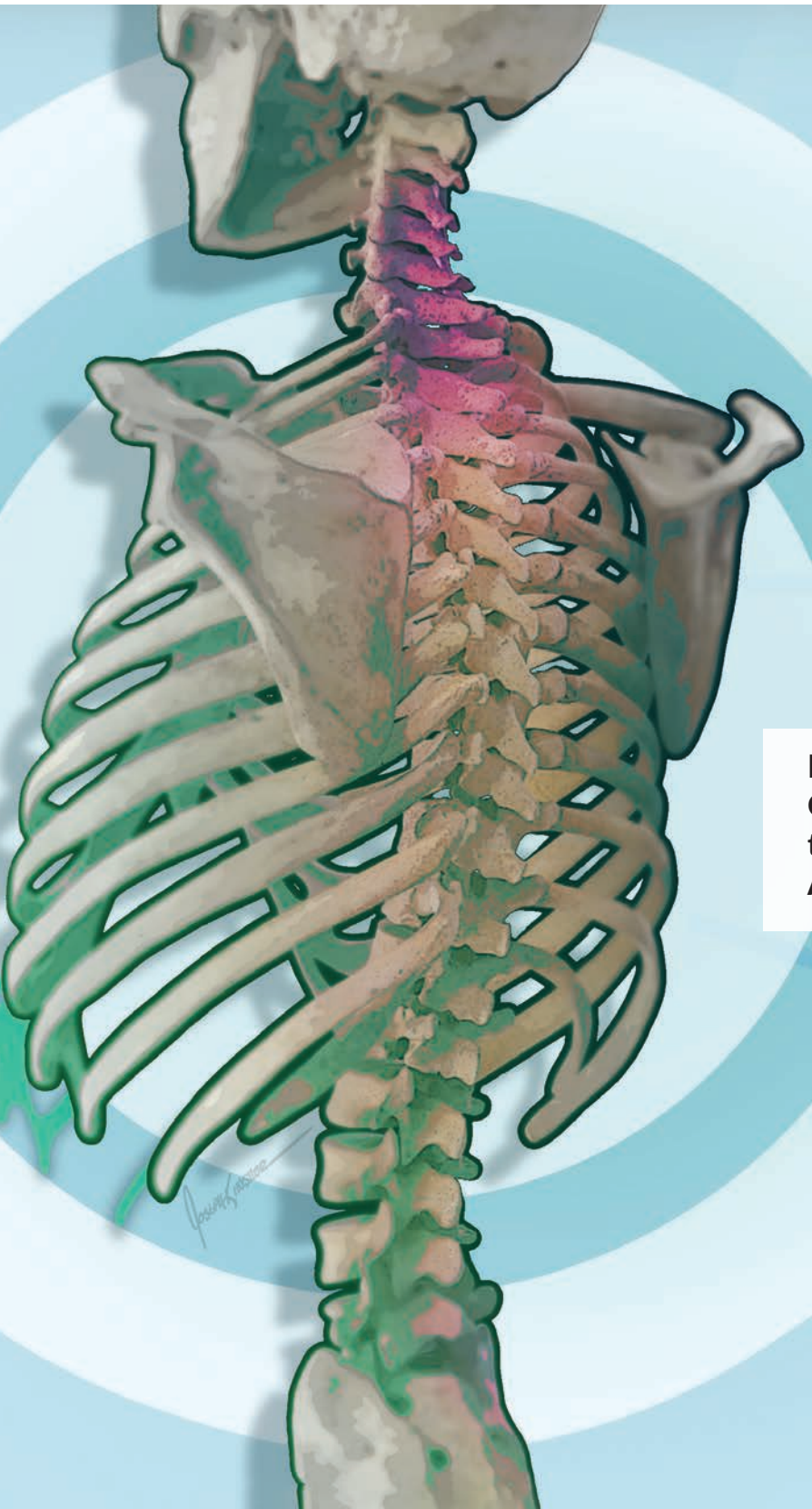
2022 / volume 34 / number 1

ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

The publication of the Academy of Orthopaedic Physical Therapy, APTA

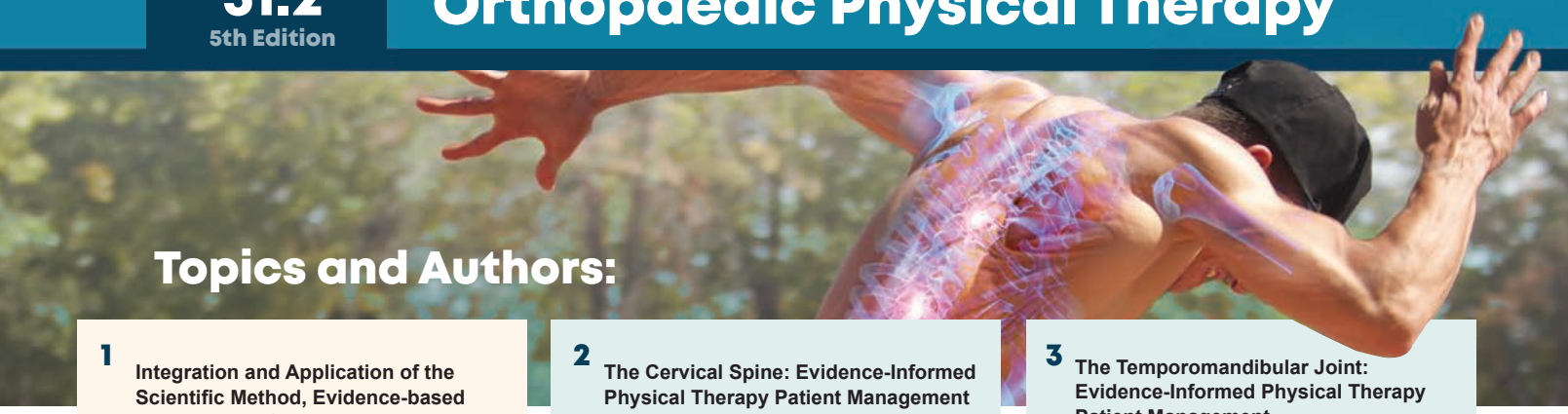


FEATURE:
Cervical Myelopathy in a Patient Referred to Physical Therapy for Polyarthralgia: A Case Report

APTA American Physical Therapy Association

ISC 31.2
5th Edition

Current Concepts of Orthopaedic Physical Therapy



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ORTHOPAEDIC
PHYSICAL THERAPY PRACTICE

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In this issue

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To serve as an advocate and resource for the practice of Orthopaedic Physical Therapy by fostering quality patient/client care and promoting professional growth.

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2022 / volume 34 / number 1

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President's Corner

An End and a New Beginning!

Joseph M. Donnelly, PT, DHSc, FAPTA

It is hard to believe that 3 years have passed since I was elected by the membership to serve as AOPT President. I want to start this update with a big thank you to the Board of Directors (BOD) and staff for their hard work and dedication during my term as President. The past couple years have been a challenging time for all of us; however due to the dedication of your elected leaders and staff, we have made significant progress moving our strategic framework forward and have been able to meet our fiduciary responsibilities keeping the Academy fiscally sound. I am writing this message in November 2021 for the January 2022 *OPTP*. I hope in the very near future the President and BOD can update the membership in real time by converting *OPTP* to an online-only publication.

In 2019, we completed bylaw amendments to increase the number of elected Directors by 2, and make the Education, Practice, and Research Chair's Ex Officio voting members of the BOD. We now have 10 voting members on the AOPT BOD and an established Executive Committee. The membership also approved an amendment to our election cycle moving it from November to August. This change in the election cycle affords newly elected Board members to become familiar with their duties and responsibilities over a 4- to 5-month period before serving in their elected position following the CSM Membership Meeting. To ensure congruency with our bylaws, the BOD updated all policies and standard operating procedures including a significant update to the special interest groups rules of order.

In October 2019, the strategic plan was updated, and we settled on a more contemporary term of Strategic Framework with 4 pillars: Diversity, Equity and Inclusion; Value and Payment; Positioning and Public Awareness; and Evidence to Best Practice. Following the October 2019 strategic framework meeting, the BOD has included the SIG and committee leadership in the October BOD meetings. The establishment of the AOPT leadership team in October of 2019 has afforded all of us the opportunity to work together under one strategic framework and do away with redundancies while maintaining each SIG's and Committee's identity and their specific value-added work. A complete update on the Strategic Framework will be presented at CSM 2022.

Additionally, we have created a memorandum of understanding (MOU) with outside associations and established our first intra-academy MOU with the Private Practice Academy to combine efforts toward value and payment. The Pain SIG published the much-needed Pain Education Manual for entry level DPT programs that meets the charge of the House of Delegates to create a document that includes information and curriculum information from the International Association for the Study of Pain. They are also pursuing clinical specialization from ABPTS. The Foot and Ankle SIG is pursuing recognition from ABPTRFE for a foot and ankle fellowship. All of the AOPT SIGs are working on some exciting initiatives in support of the new AOPT Strategic Framework.

Throughout my term as President, we have engaged with C3 leadership for leadership coaching by Bill Dickinson. I am a firm believer that all of us in leadership positions can benefit from leadership coaching and development. Some may believe that it is redundant, but I believe it is necessary to have a coach that can help us see potential blind spots or an alternative view. I want to personally thank Bill Dickinson for his commitment to the AOPT staff and BOD for the past 3 years.

At CSM 2022, my term as President will end and Bob Rowe will take the reins as the new AOPT President. I am extremely confident that Bob will lead us efficiently and effectively to accomplish the Goals and Outputs of the Strategic Framework. I look forward to seeing many of you at CSM 2022 in San Antonio. The odd part for me is that due to my health condition starting out my term as President and then the COVID-19 pandemic, this will be my first and last in person membership meeting for the AOPT. I want to take this opportunity to thank everyone for their support and confidence in my leadership. We continue to thrive despite the impact of the COVID-19 pandemic. Please, plan to attend our Awards Ceremony and Membership Meeting where you can voice your concerns, thoughts, opinions, or support. Happy Holidays and I look forward to seeing you at CSM 2022.

Best Regards,
Joe Donnelly

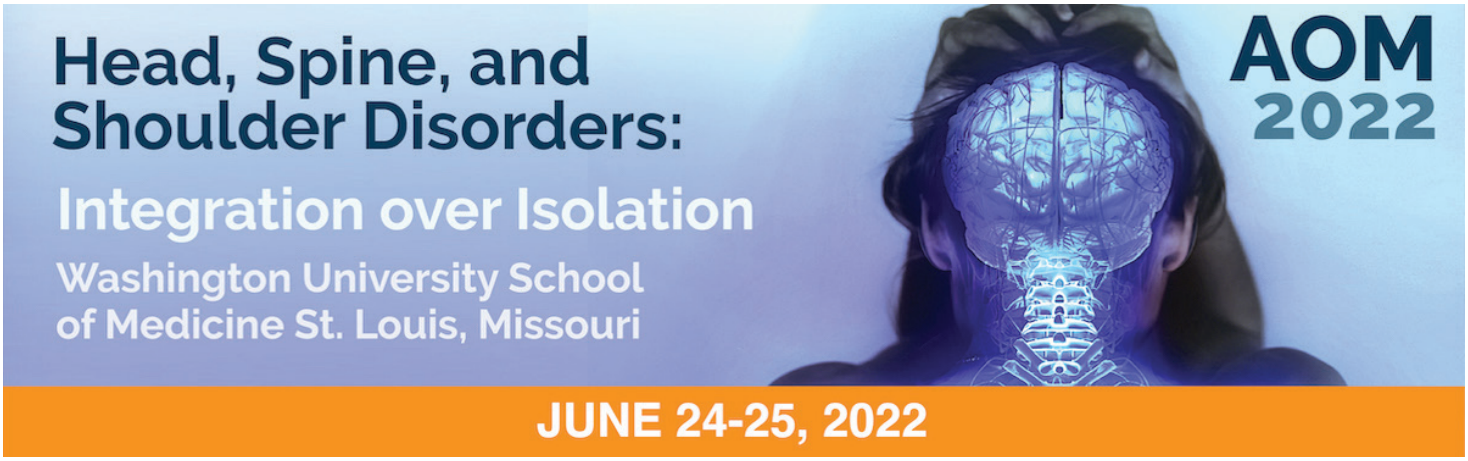
APTA **Combined Sections Meeting**
Feb. 2-5, 2022 / San Antonio, Texas

APTA American Physical Therapy Association

Mark Your Calendars for AOPT Events Friday evening to include:

Friday, February 4, 2022

Membership Meeting ..... 5:30-7:00 p.m.
Awards Ceremony..... 7:30-8:30 p.m.
Membership Appreciation Party ..... 8:30-11:00 p.m.



Register now and take advantage of our DEEP DISCOUNTS on registration!
Physical Therapists, Residents, Fellows, PhD Students, and final-year DPT students are invited!

Orthopaedic physical therapists are often presented the challenging task of treating complicated and often coexisting injuries of the head, cervicothoracic spine, and shoulder complex. The Academy of Orthopaedic Physical Therapy's 2022 Annual Orthopaedic Meeting will explore integrated evaluation and treatment principles for these regions highlighting the orthopaedic and vestibular factors affecting patients with concussion injuries, the interconnection of the head neck complex, and the relationship between the neck and shoulder in rehabilitation. A diverse team of experts will integrate best available evidence in hot topic areas and enhance participant learning with exciting laboratory breakouts focused on skill acquisition.

Friday and Saturday will begin with a general session, followed by breakout sessions, and an interactive panel discussion to end each day. Attendees will have the opportunity to attend all breakout sessions!

FRIDAY GENERAL SESSION & BREAKOUT SESSION DETAILS

Friday General Session
Title: ***Concussion: Cervico-Vestibulo-Ocular Integration over Brain Isolation***
Presenters: Airelle Giordano, PT, DPT; Rob Landel, PT, DPT, FAPTA
Description: In this session we will review the complex interaction between the central nervous system, vestibulo-ocular system and cervical musculoskeletal system in generating signs and symptoms after concussion, with special emphasis on the latter two systems. We will describe the differential diagnostic thought process and integrated management of common vestibulo-ocular and cervico-thoracic impairments that occur after a concussive event. Case examples will be used to illustrate key concepts and caveats for treatment.

Friday Breakout Session #1
Title: ***Considerations for Managing Vestibulo-ocular Impairments***
Presenter: Airelle Giordano, PT, DPT
Breakout Description: In this session we will review key tests and measures for identifying and differentiating vestibular and oculomotor impairments that contribute to symptoms post-concussion. Using case vignettes participants will be asked to identify appropriate measures, to summarize their findings and explain how the findings can be used to guide clinical practice. Participants will be given the opportunity to perform/administer the tests/measures and key manual interventions.

Friday Breakout Session #2
Title: ***Considerations for Managing Post-concussion Cervicothoracic Impairments***
Presenter: Rob Landel, PT, DPT, FAPTA
Description: In this session we will review key tests and measures for identifying and differentiating cervical and cervicothoracic musculoskeletal impairments that contribute to post-concussive event symptoms. Using case vignettes participants will be asked to identify appropriate measures, to summarize their findings and explain how the findings can be used to guide clinical practice. Participants will be given the opportunity to perform/administer the tests/measures and key manual interventions.

SATURDAY GENERAL SESSION & BREAKOUT SESSION DETAILS

Saturday General Session
Title: ***Trouble with Reaching? What Impairments are Driving the Problem?***
Presenters: Joe Godges, DPT, MA, OCS; Paula Ludewig, PhD, PT, FAPTA
Description: In this session we will review integrated upper quarter kinesia and dyskinesia (movement deviations) as related to development or outcome of common clinical tissue pathologies such as rotator cuff pathology, nerve injuries, and pain syndromes. The session will incorporate current evidence regarding relationships between impairments, movement deviations, and tissue pathologies. Emphasis will be on integrating head, neck, and shoulder clinical practice guideline recommendations into effective reasoning processes for the client and the clinician to address the client's movement related concerns.

Saturday Breakout Session #1
Title: ***Trouble with Reaching? Movement Analysis and Reeducation Strategies***
Presenter: Paula Ludewig, PhD, PT, FAPTA
Breakout Description: In this session we will overview and perform movement screening with an emphasis on scapular dyskinesias in each of the frontal (upward/downward rotation), sagittal (tilting) and transverse (internal rotation) planes. Participants will be given the opportunity to perform an upper quarter movement screening and use case vignettes to identify appropriate follow-up tests and consider diagnostically driven physical therapy interventions. Appropriate stretching, strengthening and movement coordination interventions will be discussed, including use of electromyographic biofeedback.

Saturday Breakout Session #2
Title: ***Trouble with Reaching? Manual Examination and Intervention Strategies: Addressing Relevant Pain and Mobility Impairments***
Presenter: Joe Godges, DPT, MA, OCS
Description: In this session, participants will be invited to participate in hands-on practice with co-participants with feedback from the instructor and lab assistants – so come in lab clothes and be ready to expose your neck, upper back, shoulders, and arms. There will demonstrations and practice with ongoing clinical reasoning "pearls" using live case examples. The labs practice sessions will cover examination, manual interventions, and reassessment of:

1. cervical, thoracic spine, and rib segmental mobility,
2. upper limb nerve mobility and symptomatic entrapment sites,
3. glenohumeral joint and soft tissue restrictions.

Visit www.orthopt.org today for full details and to register!

Editor's Note

In November, the Clinical Practice Guidelines for the Management of Acute and Chronic Low Back Pain Revision was published in JOSPT.[1] The focus of this revision as noted by the esteemed authors was to provide recommendations on interventions delivered by physical therapists. In this issue, we provide a Low Back Pain Decision Tree from the authors that wrote the CPG that guides clinicians on strategies to link the recommendations from the 2021 Revision to the subgroup categories recommended in the 2012 clinical practice guideline.[2] This resource provides practice tips to incorporate the practice guidelines into interventions. We feel this additional resource is a must-see addition to the *JOSPT* CPG revision.

As an author of a clinical practice guideline, I can tell you that creating this type of resource is difficult, time-intensive, and limited by the current evidence. For an example of how a CPG is limited by the current evidence, in the clinic, you may use a certain intervention that you believe works best for the patient. You may even decide to do that intervention with another patient that presents similarly. Patients may come back in to see you after that session and tell you how wonderful they felt after that intervention. You may think that intervention should be done on all patients with that clinical presentation. Then, you may look at the evidence and be discouraged to not finding any evidence to support that intervention. An example of this is the intervention used often in the clinic, dry cupping for musculoskeletal pain. In 2020, a systematic review concluded that "definitive conclusions regarding the effectiveness and safety of dry cupping for musculoskeletal pain and range of motion were unable to be made due to the low-moderate quality of evidence."[3] Understandably, there are many reasons why the quality of evidence is not there to support an intervention such as difficulty in recruiting patients, having enough patients with the diagnosis, difficulty in blinding, clinical location is not conducive to research, lack of an institutional review board, lack of individuals to do the research or no experience in research, etc.

A colleague reminded me not too long ago that the absence of evidence does not necessarily mean that an intervention does not work. To this point, this is exactly why creating a clinical practice guideline is difficult. Authors of a CPG are restricted in writing a CPG using only the highest level of evidence. In fact, in this revision CPG, only randomized controlled trials, systematic reviews, CPGs and meta-analyses were used. This is why the GRADE criteria are used to identify the level of evidence as "A" (strong evidence), "B" (moderate evidence), "C" (weak evidence), and "D" (conflicting or no evidence). The GRADE criteria also determine the verb related to the action statements of the CPG. A level "A" invokes the therapist's level of obligation to "should," the level "B" invokes the therapist's level of obligation to "may," the level "C" invokes the level of obligation to "can," and the level "D" invokes the level of obligation to "should not." Taking all of this into consideration, action statements are made that reflect the level of evidence that the authors found to support an intervention. For example, the authors of the revision CPG noted that "Physical therapists should use general exercise training to reduce pain and disability in older adults with chronic LBP." (A) This action statement receives a level "A" because there was strong evidence to support it and the verb "should" corresponds to the level of evidence found to support this statement. This is in contrast to "Physical therapists *should not* use mechanical traction for patients with chronic LBP with leg pain, based on the lack of benefit when added to other interventions." (D)

Unfortunately, when this revision came out in November, social media responded negatively to this revision. This is unfortunate but we can learn from this response. We can do a better job of understanding the limitations imposed on the authors of any clinical practice guideline. A critical issue with clinical research with low back pain is that interventions may be therapeutic for one subgroup type of low back pain but not another. Thus, if a clinical researcher applies the intervention, such as mechanical traction, to individuals who fit multiple types of subgroup and compares those results to another group with multiple types of low back pain, the measurable outcomes between the groups will likely not be significantly different. However, when an intervention, such as movement coordination training or manual therapy or behavioral counseling, is applied to individuals of the subgroup that responds well to that intervention and compares the outcomes to individuals of the same subgroup that does not receive the intervention, then, in specific cases, the measurable outcomes between the groups will be significantly different. Authors of CPGs can only make recommendations on results reported in the peer-reviewed literature. Therefore, one can view the recently published Low Back Pain CPG Revision as a celebration of the large volume of clinical research that provides strong evidence for interventions that physical therapists use every day with their patients. This CPG Revision can also guide clinical researchers on methods to use to potentially use to best match interventions to the subgroups that purportedly respond to those interventions.

In summary, CPGs enable us to identify gaps in the literature that show that specific interventions do NOT have evidence for and need to be investigated further especially in the case that we know an intervention works with our patients that we see in the clinic on an everyday basis. Instead of lambasting our colleagues, we need to understand the restrictions placed on the authors by the CPG process and appreciate the amount of work that they devoted to this rigorous product. The Academy of Orthopaedics commends the authors of this CPG and the authors of all of our outstanding CPGs as we continue to work towards providing evidence for assessment and evidence-based interventions for our patients. We intend to promote these fantastic resources for our profession and we are excited and honored to publish this Low Back Pain Decision tree in this issue of *OP*.

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Respectfully submitted,
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Low Back Pain Decision Tree

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The aim of the 2012 Academy of Orthopaedic Physical Therapy / *Journal of Orthopaedic and Sports Physical Therapy* Low Back Pain Clinical Practice Guideline (2012 LBP CPG) was to "describe the peer-reviewed literature and make recommendations related to:

(1) treatment matched to LBP subgroup responder categories
(2) treatments that have evidence to prevent recurrence of LBP
(3) treatments that have evidence to influence the progression from acute to chronic LBP and disability."[1]

Since 2012, the primary literature and associated CPG recommendations for managing individuals with LBP have consistently identified the elements of best clinical practice.[3,5,7] These elements of best practice include:

(1) ensuring that the healthcare is patient-centered and incorporates shared decision-making;
(2) assessing for medical conditions that require referral for medical or surgical management;
(3) assessing for co-existing psychosocial factors and target education, counseling, physical activity, and exercise strategies to facilitate the individual's confidence with self-managing their condition;
(4) performing examination procedures to determine relevant physical impairments that respond to matched interventions;
(5) empowering the problem-solving, coping strategies, self-monitoring skills of patients with LBP and guide them with implementing the CPG-driven recommendations;
(6) using validated outcome measures, as well as patient-specific outcome assessments, collected during the initial visit and on an ongoing basis, including scheduled interim assessments, to monitor patient progress (or lack thereof) and inform modification of the intervention approaches and tactics based upon emerging measurement data; and
(7) match education, counseling, exercise, movement training, and manual therapy interventions to the patient's clinical characteristics.

Since the 2012 CPG, recommendations from multiple CPGs have also strongly encouraged healthcare practitioners to decrease the reliance on pharmacologic interventions, especially opioids, in favor of non-pharmacologic interventions as first-line treatment for acute and chronic pain LBP.[8] For example, a key message from the 2018 publication of *The Lancet* Low Back Pain Series Working Group is that "Little prevention research exists, with the only known effective interventions for secondary prevention being exercise combined with education, and exercise alone."[3] However, these recommendations are made broadly without providing substantial guidance to clinicians for implementing non-pharmacologic treatments. Thus, the 2021 AOPT/*JOSPT* LBP CPG Revisions[4] (2021 CPG Revision) focused on guiding clinicians to focus on relieving pain, improving function, and/or reducing disability in individuals with LBP by using recommendations for the following interventions:

(1) Exercise
(2) Manual and Other-Directed Therapies
(3) Classification Systems
(4) Patient Education

This Low Back Pain Decision Tree intends to integrate the recommendations from the 2012 CPG,[1] the elements of best practice consistently recommended in clinical practice guidelines for management of individuals with LBP,[2,3,5-10] and the 2021 CPG Revision[4] by providing an algorithmic presentation of the decisions that healthcare practitioners, along with individuals who are experiencing LBP, should make for addressing the impairments of body function, activity limitations, and participation restrictions associated with LBP.

The 2012 CPG made recommendations for classifying individuals with low back and back-related lower extremity pain into one or more impairment-based patterns and matched interventions that can best be used to normalize or reduce impairments related to an individual's reported symptoms and activity limitations.[1] These sub-group patterns

were labeled using the impairments of body function terminology from the World Health Organization's International Classification of Functioning, Disability, and Health.[11] The 2021 CPG Revision focused on analyzing the exercise, manual or other directed therapy, patient education, and the influence of subgroup categorization on treatment outcomes. The systematic search in this CPG revealed studies where individuals with identified movement coordination impairments were matched with specific trunk activation and movement control interventions for individuals with acute and chronic LBP, reporting superior outcomes when compared to unmatched comparison or controlled interventions. However, the inclusion criteria in the other LBP intervention studies referenced in the 2021 CPG Revision were not specific enough to describe whether or not the participants' clinical characteristics were consistent with one or more of the ICF-based LBP subgroups noted in the 2012 CPG. Thus, except for Low Back Pain with Movement Coordination Impairments, there is not evidence for matching the intervention recommendations of the 2021 CPG Revision to the ICF-based LBP sub-group noted in the 2012 CPG. Therefore, the suggested matched interventions in this decision tree are best practice suggestions that blend recommendations from both the 2012 CPG and 2021 CPG Revision to help guide clinicians on strategies to link the recommendations from the 2021 CPG Revision[4] with the subgroup categories recommended in the 2012 CPG.[1] Published clinical studies that analyze the outcomes of interventions provided (or not provided) with patients that included identified ICF-based LBP sub-groups would potentially enable more specific recommendations to be made in future LBP CPG Revisions.

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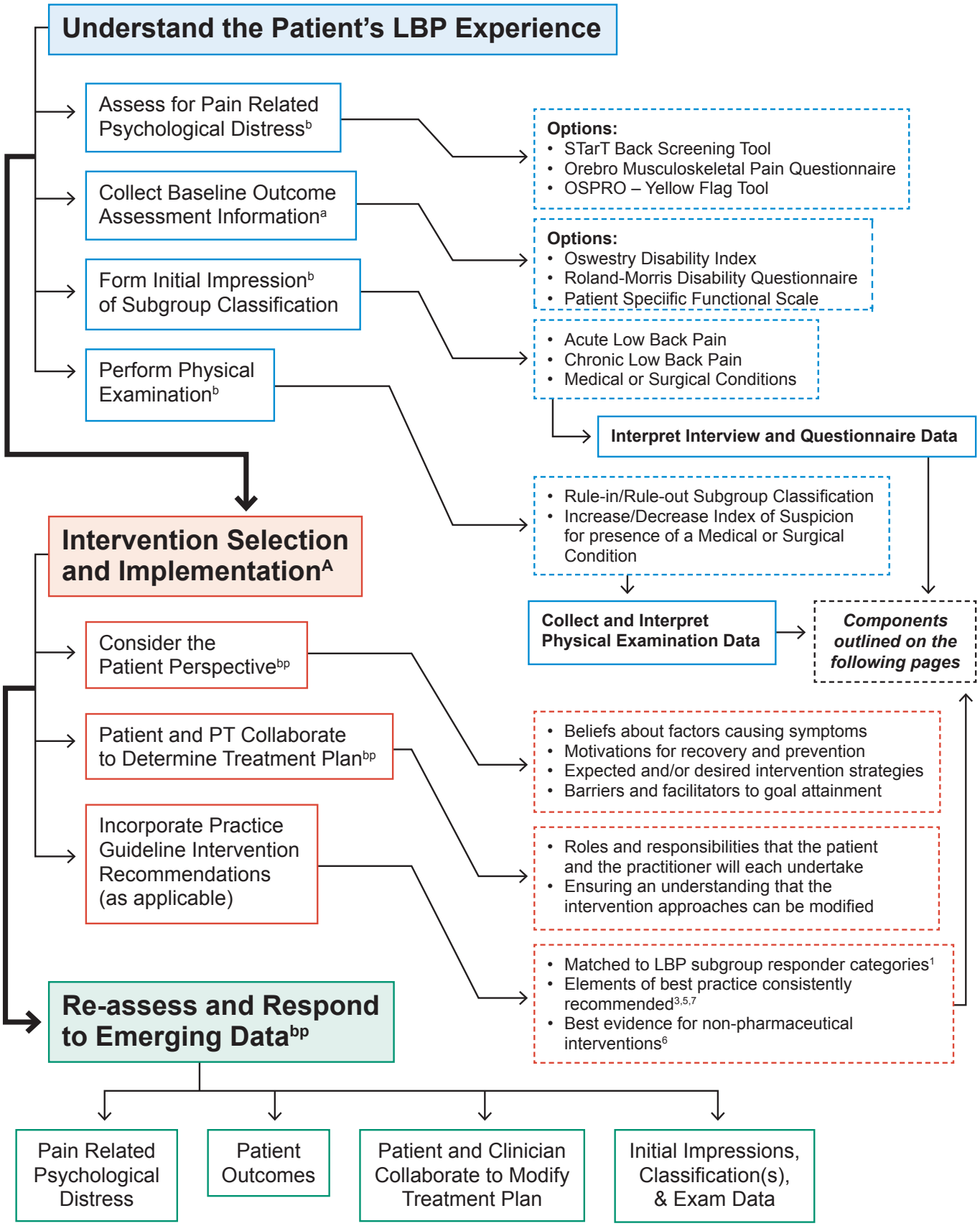
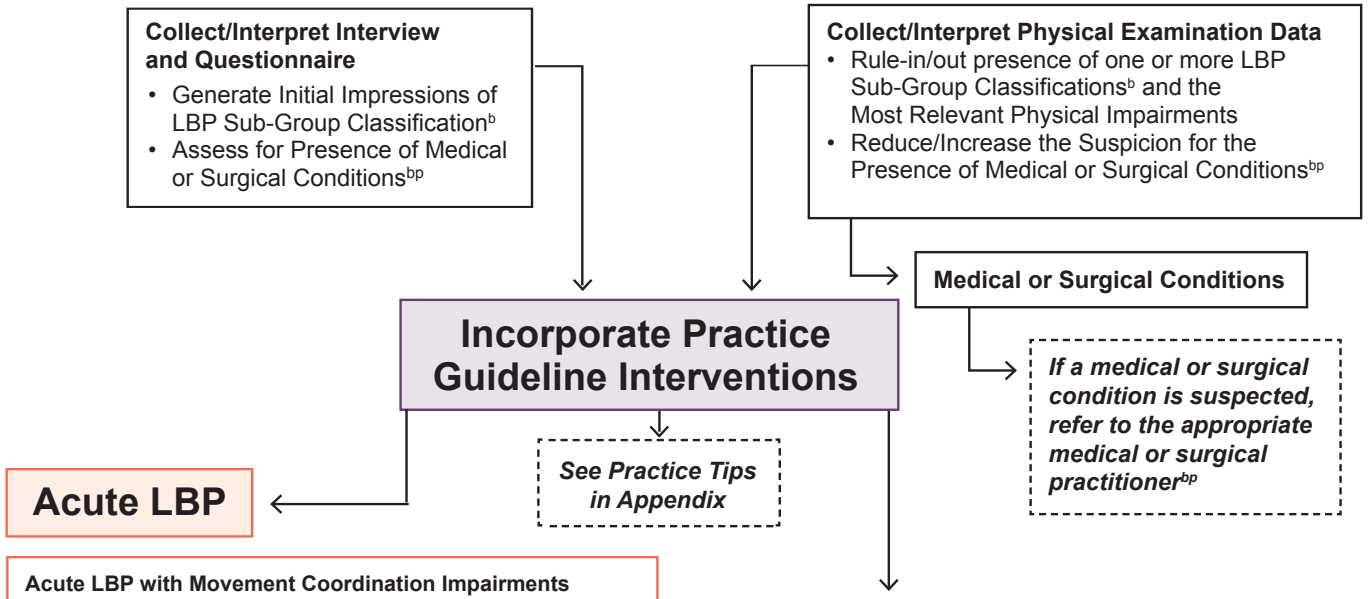
LOW BACK PAIN DECISION TREE



LOW BACK PAIN DECISION TREE



Acute LBP

Acute LBP with Movement Coordination Impairments
Suggested Matched Interventions
- Specific Trunk Activation[B] Training
- Trunk Muscle Strengthening and Endurance[B] Exercises
- Thrust or Non-Thrust Joint Mobilization, Soft Tissue Mobilization, and Massage
- Active Education and Advice[B] to pursue an active lifestyle
- Education on the Favorable Natural History[B] of Acute LBP and Self-Management Techniques[B]

Acute LBP with Related Cognitive or Affective Tendencies
Suggested Matched Interventions
- Prognostic Risk Stratification to Prioritize Interventions to Address Biopsychosocial Contributors to Pain[b]
- Pain Neuroscience Education
- General Exercise Training[b], Aerobic Exercises, and Active Education and Advice[b]

Acute LBP with Mobility Deficits
Suggested Matched Interventions
- Thrust or Non-Thrust Joint Mobilization,[a] Soft Tissue Mobilization,[b] and Massage
- General Exercise Training[b]
- Active Education and Advice[b] to Pursue an Active Lifestyle
- Education on the Favorable Natural History[b] of Acute LBP and Self-Management Techniques[b]

Acute LBP with Related (Referred) Lower Extremity Pain
Suggested Matched Interventions
- Mechanical Diagnosis and Therapy[a] interventions
- Progress to Acute LBP with Movement Coordination Impairments intervention strategies

Acute LBP with Radiating Pain
Suggested Matched Interventions
- General Exercise Training[B] and Neural Tissue Mobilization[c]
- Thrust or Non-Thrust Joint Mobilization,[c] Soft Tissue Mobilization,[c] and Massage[c]
- Education on the Favorable Natural History[b] of Acute LBP and Self-Management Techniques[B]

Chronic LBP

Chronic LBP with Movement Coordination Impairments
Suggested Matched Interventions
- Specific Trunk Activation[A] and Movement Control[A] Training
- Trunk Muscle Strengthening and Endurance[A] Exercises
- Thrust or Non-Thrust Joint Mobilization,[A] Soft Tissue Mobilization,[B] and Massage[C]
- Active Education[B] to Pursue an Active Lifestyle

Chronic LBP with Radiating Pain
Suggested Matched Interventions
- General Exercise Training and Neural Tissue Mobilization[B] Exercises
- Thrust or Non-Thrust Joint Mobilization,[b] Soft Tissue Mobilization,[b] and Massage[C]
- Active Education[b] to Pursue an Active Lifestyle

Chronic LBP with Generalized Pain
Suggested Matched Interventions
- Prognostic Risk Stratification[B] to Prioritize Interventions to Address Biopsychosocial Contributors to Pain[B]
- Pain Neuroscience Education[A]
- General Exercise Training,[A] Aerobic Exercises,[A] and Active Education and Advice[B]
- Cognitive Functional Therapy[B] to Address Multiple Components Associated with LBP

Recommendations from the 2012 CPG[1] are designated with small case letters, and Recommendations from the 2021 CPG Revision[4] are designated with capital letters, where an "a" or "A" represents Strong Evidence, a "b" or "B" represents Moderate Evidence, and a "c" or "C" represents Weak Evidence. Recommendations consistently summarized in syntheses[3,5,7] of high quality, clinical practice guidelines[2,6,8-10] are designed with "bp" and represents Best Practice.

Practice Tips for **Interpreting Interview and Questionnaire Data** to Generate Initial Impressions of Low Back Pain Sub-Group Classification or the Presence of Medical or Surgical Conditions

Acute LBP

Acute LBP with Mobility Deficits
- Acute low back, buttock, or thigh pain (≤6 weeks)
- Onset of symptoms is often linked to a recent unguarded/awkward movement or position

Acute LBP with Movement Coordination Impairments
- Acute exacerbation of recurring LBP that is commonly associated with referred lower extremity pain
- Symptoms often include numerous episodes of low back and/or low back-related lower extremity pain in recent years

Acute LBP with Related (Referred) Lower Extremity Pain
- LBP commonly associated with referred buttock, thigh, or leg pain, that worsens with flexion activities and sitting
- Reports numerous low back-related lower extremity pain episodes

Acute LBP with Radiating Pain
- Acute LBP with associated radiating (narrow band of lancinating) pain in the involved lower extremity
- Lower extremity paresthesias, numbness, and weakness may be reported

Acute LBP with Related Cognitive or Affective Tendencies
- Acute or subacute low back and/or low back-related lower extremity pain

Chronic LBP

Chronic LBP with Movement Coordination Impairments
- Chronic, recurring LBP that is commonly associated with referred lower extremity pain

Chronic LBP with Radiating Pain
- Chronic, recurring, mid-back and/or LBP with associated radiating pain and potential sensory, strength, or reflex deficits in the involved lower extremity
- Lower extremity paresthesias, numbness, and weakness may be reported

Chronic LBP with Generalized Pain
- Low back and/or low back-related lower extremity pain with symptom duration for longer than 3 months
- Generalized pain not consistent with other impairment-based classification criteria
- Cognitive processes or affective behaviors exhibited that suggest the presence of fear-avoidance beliefs, pain catastrophizing, and/or depression

Medical or Surgical Conditions

Back Related Tumor
- Constant pain not affected by position or activity, worse at night
- Age over 50; History of cancer; Failure of conservative intervention
- Unexplained weight loss
- No relief with bed-rest

Cauda Equina syndrome
- Urine retention or incontinence; Fecal incontinence
- Saddle anesthesia
- Global or progressive weakness in the lower extremities

Back-related Infection
- Recent infection (eg, urinary tract or skin)
- Intravenous drug user/abuser
- Concurrent immunosuppressive disorder
- Reports of fever, malaise, and swelling

Spinal Compression Fracture
- History of major trauma, such as vehicular accident, fall from a height, or direct blow to the spine
- History of minor trauma for osteoporotic or elderly individuals, such as falls or heavy lifts
- Age over 75
- Prolonged use of corticosteroids

Abdominal Aneurysm
- Back, abdominal, or groin pain
- Presence of peripheral vascular disease or coronary artery disease and associated risk factors (age over 50, smoker, hypertension, diabetes mellitus)

Practice Tips for **Interpreting Physical Examination Data** to Rule-in / Rule-out the Presence LBP Sub-Group Classifications and Reduce / Increase the Suspicion for the Presence of Medical or Surgical Conditions

Acute LBP Subgroups

Acute LBP with Mobility Deficits

Rule-in if:
- Lower thoracic or lumbar range of motion limitations
- Low back and low back-related lower extremity reproduced with (1) end-range spinal motions, and (2) provocation of the involved lower thoracic or lumbar segments

Rule-out if:
- Combined end-range spinal motions (eg, end-range lumbar extension combined with end-range lumbar sidebending) with clinician-provided overpressure into the combined motion is pain free
- Unable to produce reported low back or low back-related lower extremity pain with provocation (eg, end-range unilateral posterior-to-anterior pressures) of the lower thoracic or lumbar segments

Acute LBP with Movement Coordination Impairments

Rule-in if:
- Symptoms reproduced with (1) mid-range motions that worsen with end-range movements or positions, and (2) provocation of the involved lumbar segment(s)
- Observable movement coordination impairments of the lumbopelvic region with flexion and extension movements or while performing daily physical activities
- Diminished trunk or pelvic region muscle strength and endurance
- Mobility deficits of the thorax and hips regions may be present
- Signs of lumbar segmental or sacroiliac hypermobility may be present

Rule-out if:
- Presence of adequate left and right passive straight leg raise (80°) and thorax rotation (80°) mobility
- Presence of normal trunk flexor (eg, double-leg lowering test), trunk extensors (Sorensen test), lateral abdominals and hip abductors (eg, side plank/side bridge tests) and hip and thigh muscle performance (star excursion balance tests)

Acute LBP with Related (Referred) Lower Extremity Pain

Rule-in if:
- Low back and lower extremity pain that can be centralized and diminished with positioning, manual procedures, and/ or repeated movements
- Lateral trunk shift, reduced lumbar lordosis, limited lumbar extension mobility, and clinical findings associated with the acute or chronic low back pain with movement coordination impairments category are commonly present

Rule-out if:
- Baseline assessments of pain location and pain levels are not altered with prolonged positioning, manual procedures (eg, lateral shift correction), or repeated movements (eg, prone press-ups)

Acute LBP with Radiating Pain

Rule-in if:
- Symptoms are reproduced or aggravated with mid-range and worsen with end-range spinal mobility, lower limb tension/ straight leg raising, and/or slump tests
- Signs of nerve root involvement (sensory, strength, or reflex deficits) may be present

Rule-out if:
- Lower limb tension tests (eg, straight leg raising) or slump testing do not reproduce reported low back or leg pain

It is common for the symptoms and impairments of body function in patients who have Acute LBP with Radiating Pain to also be present in patients who have Acute LBP with Related (Referred) Lower Extremity Pain

Acute LBP with Related Cognitive or Affective Tendencies

Rule-in if:
- Clinical presentation suggesting the presence of fear-avoidance, pain catastrophizing, or depression, such as:
  - High scores on the psychosocial subscale of the STarT Back Screening tool, assessing for bothersome, fear, catastrophizing, anxiety, and depressive tendencies
  - High scores on the Fear-Avoidance Beliefs Questionnaire and behavioral processes consistent with an individual who has excessive anxiety or fear
  - High scores on the Pain Catastrophizing Scale and cognitive process consistent with rumination, pessimism, or helplessness
  - High scores on the Patient Health Questionnaire-2 or PHQ-9 or Beck Depression Inventory and affect consistent with an individual who is depressed

Rule-out if:
- Scores on the psychosocial subscale of the STarT Back Screening tool total to be 0

Medical or Surgical Conditions

Back Related Tumor

Increase index of suspicion if:
- Constant pain not affected by movement, but worse with weight bearing
- Pain not responsive to therapy (failure to improve within 30 days)

Reduce index of suspicion if:
- Clinical findings are consistent with one or more of the ICF-based LBP subgroups
- Symptoms are resolving with subgroup matched interventions

Cauda Equina syndrome

Increase index of suspicion if:
- Saddle anesthesia
- Sensory or motor deficits in the feet (L4, L5, S1 areas)

Reduce index of suspicion if:
- Lower extremity sensation is normal or improving
- Lower extremity muscle performance is normal or improving

Back-related Infection

Increase index of suspicion if:
- Fever, malaise, and swelling
- Spine rigidity; accessory mobility may be limited
- Elevated body temperature, increasing suspicion of:
  - tuberculosis osteomyelitis
  - pyogenic osteomyelitis
  - spinal epidural abscess

Reduce index of suspicion if:
- Body temperature is normal
- Clinical findings are consistent with one or more of the ICF-based LBP subgroups

Spinal Compression Fracture

Increase index of suspicion if:
- Increased pain with weight bearing
- Point tenderness over site of fracture

Reduce index of suspicion if:
- Age of 50 years or less
- Symptoms are not aggravated with weight loading or thoracolumbar flexion movements
- Clinical findings are consistent with one or more of the ICF-based LBP subgroups

Abdominal Aneurysm

Increase index of suspicion if:
- Symptoms not related to movement stresses associated with somatic LBP
- Abdominal girth <100 cm (40 in)

If a medical or surgical condition is suspected, refer to the appropriate medical or surgical practitioner

Practice Tips for **Interpreting Physical Examination Data** to Rule-in / Rule-out the Presence Chronic LBP Sub-Group Classifications Conditions

Chronic LBP Subgroups

Chronic LBP with Movement Coordination Impairments

Rule-in if:

- Low back and/or low back–related lower extremity pain that worsens with sustained end-range movements or positions
- Observable movement coordination impairments of the lumbopelvic region with flexion and extension movements or while performing daily, occupational, or recreational activities
- Diminished trunk or pelvic region muscle strength and endurance
- Mobility deficits of the thorax and hips may be present
- Signs of lumbar segmental or sacroiliac hypermobility may be present

Rule-out if:

- Presence of adequate left and right passive straight leg raise (80°) and thorax rotation (80°) mobility
- Presence of normal trunk flexor (eg, double-leg lowering test), trunk extensors (Sorensen test), lateral abdominals and hip abductors (eg, side plank/side bridge tests) and hip and thigh muscle performance (star excursion balance tests)

Chronic LBP with Radiating Pain

Rule-in if:

- Symptoms are reproduced or aggravated with sustained end-range lower-limb nerve tension/straight leg raise and/ or slump tests

Rule-out if:

- Lower limb tension tests (eg, straight leg raising) or slump testing do not reproduce reported low back or leg pain

Chronic LBP with Generalized Pain

Rule-in if:

- Clinical presentation suggesting the presence of fear-avoidance, pain catastrophizing, or depression, such as:
  - High scores on the psychosocial subscale of the STarT Back Screening tool, assessing for bothersome, fear, catastrophizing, anxiety, and depressive tendencies
  - High scores on the Fear-Avoidance Beliefs Questionnaire and behavioral processes consistent with an individual who has excessive anxiety or fear
  - High scores on the Pain Catastrophizing Scale and cognitive process consistent with rumination, pessimism, or helplessness
  - High scores on the Patient Health Questionnaire-2 or PHQ-9 or Beck Depression Inventory and affect consistent with an individual who is depressed

Rule-out if:

- Scores on the psychosocial subscale of the STarT Back Screening tool total to be 0

Practice Tips for Incorporating Practice Guideline Intervention Recommendations

Acute LBP with **Mobility Deficits** – *Suggested Matched Interventions*

- Thrust or Non-Thrust Joint Mobilization, Soft Tissue Mobilization, and Massage to diminish pain, reduce disability, and improve thoracolumbar mobility
- General Exercise Training to improve or maintain thorax, low back, and hip mobility
- Active Education and Advice to Pursue an Active Lifestyle
- Education on the Favorable Natural History of Acute LBP and Self-Management Techniques to prevent recurring low back pain episodes, such as routine participation or activities that enhance flexibility

Acute LBP with **Movement Coordination Impairments** – *Suggested Matched Interventions*

- Specific Trunk Activation Training to promote dynamic (muscular) stability to maintain the involved lumbosacral structures in less symptomatic, mid-range positions while performing activities
- Trunk Muscle Strengthening and Endurance Exercises to address identified trunk and pelvic-region movement system impairments
- Thrust or Non-Thrust Joint Mobilization, Soft Tissue Mobilization, and Massage to diminish pain, reduce disability, improve thorax and hip mobility, and mobilize hypomobile lumbopelvic segments
- Active Education and Advice to Pursue an Active Lifestyle
- Education on the Favorable Natural History of Acute LBP and Self-Management Techniques to prevent recurring LBP episodes, such as routine participation in activities that improve movement coordination

Acute LBP with **Related (Referred) Lower Extremity Pain** – *Suggested Matched Interventions*

- Mechanical Diagnosis and Therapy interventions that employ manual therapy, postures, positions, repeated movements, or traction procedures that promote centralization and improve lumbar extension mobility
- Progress to Acute Low Back Pain with Movement Coordination Impairments intervention strategies

Acute LBP with **Radiating Pain** – *Suggested Matched Interventions*

- General Exercise Training and Neural Tissue Mobilization to reduce pain and improve mobility of the central (dural) and peripheral neural elements
- Thrust or Non-Thrust Joint Mobilization, Soft Tissue Mobilization, and Massage to diminish pain, reduce disability, and mobilize the articulations and soft tissues adjacent to the involved nerve root(s) or nerves that exhibit mobility deficits
- Education on the Favorable Natural History of Acute LBP and Self-Management Techniques to prevent recurring low back pain episodes, such as routine use of (1) positions that reduce strain or compression to the involved nerve root(s) or nerves, and (2) activities that promote painfree nerve mobility

Acute LBP with **Related Cognitive or Affective Tendencies** – *Suggested Matched Interventions*

- Prognostic Risk Stratification to Prioritize Interventions to Address Biopsychosocial Contributors to Pain in individuals with acute low back pain that are associated with the progression to chronic LBP
- Pain Neuroscience Education to lessen fear-avoidance and catastrophizing tendencies associated with LBP disability
- General Exercise Training, Aerobic Exercises, and Active Education and Advice to reduce depressive symptoms associated with LBP disability

Chronic LBP with **Movement Coordination Impairments** – *Suggested Matched Interventions*

- Specific Trunk Activation and Movement Control training to promote dynamic (muscular) stability to maintain the involved lumbosacral structures in less symptomatic, midrange positions while performing activities
- Trunk Muscle Strengthening and Endurance exercises to address identified trunk and pelvic-region movement system impairments
- Thrust or Non-Thrust Joint Mobilization, Soft Tissue Mobilization, and Massage to diminish pain, reduce disability, and improve thorax and hip mobility, and mobilize hypomobile lumbopelvic segments
- Active Education to Pursue an Active Lifestyle, such as routine participation in activities that improve movement coordination

Chronic LBP with Radiating Pain – *Suggested Matched Interventions*

- General Exercise Training and Neural Tissue Mobilization exercises to reduce pain and improve mobility of the central (dural) and peripheral neural elements
- Thrust or Non-Thrust Joint Mobilization, Soft Tissue Mobilization, and Massage to diminish pain, reduce disability, and mobilize the articulations and soft tissues adjacent to the involved nerve root(s) or nerves that exhibit mobility deficits
- Active Education to Pursue an Active Lifestyle, activities that promote pain-free nerve mobility

Chronic LBP with Generalized Pain – *Suggested Matched Interventions*

- Prognostic Risk Stratification to Prioritize interventions to address Biopsychosocial Contributors to Pain
- Pain Neuroscience Education to lessen fear-avoidance and catastrophizing tendencies associated with low back pain disability
- General Exercise Training, Aerobic Exercises, and Active Education and Advice to reduce depressive symptoms associated with low back pain disability
- Cognitive Functional Therapy to address multiple components associated with low back pain including pathoanatomical, physical, psychological, social, lifestyle, and health-related risk factors

Cervical Myelopathy in a Patient Referred to Physical Therapy for Polyarthralgia: A Case Report

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ABSTRACT

Background and Purpose: Cervical myelopathy (CM) is a progressive neurological condition that is difficult for health care practitioners to diagnose and treat. The purpose of this case report is to highlight the physical therapist's role in identifying the clinical presentation of CM and when it warrants further medical evaluation. **Methods:** Case description of a patient with decreased cervical motion, weakness of both hands and legs, sensory loss of both hands, hyperreflexia, and sudden onset of ataxia who was referred to physical therapy for polyarthralgia. **Findings:** Magnetic resonance imaging demonstrated severe cervical spinal canal stenosis with spinal cord impingement. After 2 months of an anti-inflammatory medication regimen, the patient's symptoms resolved. At 1-year follow-up, the patient remained symptom-free on the same medication regimen. **Clinical Relevance:** In this case, the physical therapist expedited the patient's CM diagnosis and management. **Conclusion:** Physical therapists play an important role in the time-sensitive diagnosis of CM.

Key Words: central canal stenosis, spinal cord impingement, spondylosis

INTRODUCTION

Cervical myelopathy (CM) is characterized by compression of the spinal cord in the cervical spinal canal. Compression may be caused by several factors such as trauma, tumor, disc herniation, infection, or autoimmune disorders.[1] Common degenerative changes such as spondylosis, stiffening of connective tissue, or osteophyte formation may also contribute to spinal canal narrowing and cord compression.[2] Approximately 90% of septuagenarians demonstrate spinal cord compression related to degenerative spinal canal narrowing.[3] This suggests that CM is a common part of the aging process and radiologic evidence must be paired with the clinical presentation to determine its implications.

Tetrault et al[4] established criteria for classifying CM as mild, moderate, or severe by using the modified Japanese Orthopaedic Association scale (mJOA). The mJOA is a psychometrically valid and responsive tool that uses a numeric rating system to assess motor dysfunction of the upper and lower extremities, sensory dysfunction of the upper extremities, and sphincter dysfunction.[5] Scores less than 12 indicate severe CM, scores from 12 to 14 indicate moderate CM, and scores of 15 to 17 indicate mild CM. This characterization is based on clinical presentation and is only applicable to subjects with confirmed CM on imaging.

According to the clinical practice guideline developed by Fehlings et al,[6] surgical intervention such as laminectomy with fusion or laminoplasty is recommended for those with moderate or severe degenerative CM. The prevalence of surgically treated cervical spondylotic myelopathy is estimated at 1.6 per 100,000 cases.[7] If the condition is mild, a trial of nonoperative management may be instituted, with surgical intervention recommended if there is neurologic worsening or lack of improvement.[6] A systematic review by Tetrault et al[8] demonstrated that nonoperative management is not well defined in the literature and varies across studies. Nonoperative management may consist of immobilization, bed rest, anti-inflammatory medication, manual therapy, therapeutic exercise, or cervical traction among other treatments. The clinical practice guideline developed by the American Physical Therapy Association recommends using an impairment-based classification system to differentiate between interventions when managing patients with neck pain.[9] However, the impairments associated with CM do not fit in this classification system easily and the clinical practice guideline makes no intervention recommendations for CM specifically. This insufficient definition of nonoperative management and lack of clear evidence make it difficult to interpret the outcomes of nonoperative management appropriately.

As CM is a progressive condition, delayed diagnosis increases disability and negatively impacts postoperative outcomes.[10] Historically, authors suggest that CM remains stable over very long periods with little progression.[11] However, growing evidence describes the likelihood that CM leads to gradual neurological deterioration.[8] A 2013 systematic review by Karadimas et al[12] found that mJOA scores decrease by at least 1 point in 20% to 60% of patients within 3 to 6 years of initial assessment. According to a retrospective study by Behrbalk et al[13] the time elapsed from initiation of symptoms to diagnosis of CM was 2.2 ± 2.3 years. One proposed reason for delayed diagnosis is an incomplete assessment in primary care.[10] Cervical myelopathy is often misdiagnosed as carpal tunnel syndrome or cervical radiculopathy.[13]

Clinical presentation of CM varies widely among patients, making it difficult to diagnose.[1] Typically, the chronic mechanical cord compression associated with CM leads to direct injury of the neurons and glia, with the spinocerebellar and corticospinal tracts being the first affected. This results in upper motor neuron signs on the clinical examination, as well as fine motor deficits and gait disturbance being early symptoms.[14,15] However, signs and symptoms can vary widely from neck stiffness, shoulder and arm pain, weakness of the arms and legs, and coordination loss.[2] Efforts have been made to determine the predictive value of clinical tests in the diagnosis of CM. The **Table** summarizes the diagnostic utility of subjective findings and clinical tests as reported by Cook et al.[16]

Cook et al[17] also reported the diagnostic utility of a cluster of 5 clinical findings. This included age greater than 45 years, positive Babinski Sign, positive Hoffman Sign, positive Inverted Supinator Sign, and gait deviation (abnormally wide-based gait, ataxia, or spastic gait). If 1 out of 5 tests is positive, the negative likelihood ratio is 0.18. If 3 out of 5 tests are positive, the positive likelihood ratio is 30.9. These clusters help identify patients with CM, but a timely diagnosis continues to prove difficult for clinicians.

Physical therapists' ability to screen for this condition adequately could lead to a more timely diagnosis and improved quality of life. As autonomous practitioners, physical therapists are responsible for completing a thorough evaluation and must identify patients who require referral to another health care practitioner. Multiple cases in the

literature document physical therapists being the first to identify the presence of CM.[18,19] The purpose of this case report is to discuss the importance of a thorough examination and sound clinical reasoning when CM may be included in the differential diagnosis.

CASE DESCRIPTION

History

The patient was a 74-year-old right-hand dominant male, who worked as a self-described "handy man". He was referred to physical therapy from a geriatric specialty clinic with a diagnosis of polyarthralgia. The patient's symptoms included bilateral lower extremity pain, bilateral lower extremity weakness, and poor balance. He was unable to localize pain to specific joints or regions, describing the pain as diffuse. The symptoms began insidiously one month earlier and were progressively worsening. He described difficulty with sit-to-stand transfers, requiring the use of his arms to push himself up from the chair and moving slowly to maintain balance. He also described difficulty walking and needing to lean on furniture around the house for external support.

In addition to lower extremity symptoms, the patient also had weakness and numbness in both hands that began 2 months earlier after using a power saw for several hours. Since then, the bilateral hand symptoms had progressively worsened such that he could not hold a coffee cup or grip a steering wheel. He had a positive past medical history for bilateral carpal tunnel syndrome and bilateral ulnar neuropathy. He was scheduled to see a hand surgeon for bilateral carpal tunnel release and was not interested in physical therapy treatment for his hands.

Before the physical therapy evaluation, the patient had radiograph imaging of both hips, the thoracic spine, and the cervical spine, as well as hematology tests. The radiology report included mild bilateral hip osteoarthritis, 3 lower thoracic vertebral body compression deformities of indeterminate age, diffuse osteopenia, multi-level cervical and thoracic degenerative disc disease most severe at C5-6, diffuse cervical facet arthropathy with osseous overgrowth, and mild to moderate stenosis of the left C6-7 and right C5-6 foramen. The hematology tests revealed an elevated c-reactive protein and erythrocyte sedimentation rate, both measures of inflammation.

Further relevant medical history of this patient included basal cell carcinoma, squamous cell carcinoma, hypertension, atrial fibrillation, depression, and anxiety. He denied any neck pain, radiating pain, traumatic injuries, fever, chills, sweats, unexplained weight change, nausea, vomiting, dizziness, lightheadedness, changes in cognition, saddle paresthesia, or changes in bowel and bladder.

After completing the patient's subjective history, an objective examination focused on red flag screening and differential diagnosis of CM was completed. Other differential diagnoses such as polyarthralgia, carpal tunnel syndrome, ulnar neuropathy, cervical radiculopathy, lumbar spinal stenosis, or other inflammatory or progressive neurological disorders were also considered.

EXAMINATION

Observation of the patient showed a well-appearing adult male with significant thoracic kyphosis and forward head posturing. Bilateral hands were normal in color and temperature with no swelling or notable atrophy. The patient was unable to close either hand actively into a fist or achieve full extension of any fingers actively. Decreased sensation to light touch was present in both hands in a glove distribution. Further neurological assessment revealed hyper-reflexia (3+) of the bilateral brachioradialis, biceps, and patellar tendons.

Range of motion assessment of the shoulders, hips, and knees was within normal limits and pain-free. However, cervical extension, bilateral cervical rotation, and bilateral cervical side bending were approximately 50% limited and pain-free. Strength assessment using manual muscle testing revealed 3/5 bilateral shoulder flexion, 3/5 bilateral shoulder abduction, 3/5 bilateral elbow flexion, 3+/5 bilateral knee extension, and 3+/5 bilateral knee flexion which were all pain-free. Palpation of the patient's cervical spine revealed excess adipose tissue along the posterior neck, which combined with forward head posturing rendered the spinous processes of C3-5 unable to be palpated and assessed for tenderness.

The patient passed all conditions of the modified clinical test of sensory integration on balance except for condition 4 that involves standing with eyes closed on a foam surface, in which he lost balance after 20 seconds. When performing a sit-to-stand transfer, the patient used the back of his knees against the chair and assisted himself with his hands. The patient ambulated with a wide base of support and occasional staggers but was able to catch himself. With tandem ambulation, the patient was unable to take any steps without assistance from the therapist.

EVALUATION

Data from the subjective and objective portion of the examination indicated that CM was the most probable diagnosis. This diagnosis was supported by findings of ataxia, hyperreflexia, sensory disturbance of the hands, intrinsic hand weakness, decreased cervical range of motion, and multi-level weakness. Polyarthralgia was unlikely since the patient's pain was not localized to his joints and there was no swelling. He had full, pain-free range of motion of the lower extremities, and pain was not worsened by activity or improved with rest.[20] Bilateral carpal tunnel syndrome and ulnar neuropathy were also unlikely since symptoms were not consistent with peripheral nerve patterns and the patient had lower extremity symptoms.[21] Furthermore, the patient had not

Table. Diagnostic Utility of Subjective Findings and Clinical Tests[15]

Subjective Finding or Clinical Test	Sensitivity	Specificity	Likelihood Ratio (+)	Likelihood Ratio (-)
Report of current neck pain	93%	18%	1.1	0.4
Report of loss of dexterity	73%	27%	1.1	0.9
Report of numbness in the hands	57%	67%	1.7	0.6
Report of clumsiness during gait	53%	52%	1.1	0.9
Hoffman's sign	44%	75%	1.8	0.7
Deep tendon reflexes	44%	71%	1.5	0.8
Inverted supinator sign	61%	78%	2.8	0.5
Suprapatellar tendon reflex	56%	33%	0.8	1.3
Hand withdrawal reflex	41%	63%	1.1	0.9
Babinski sign	33%	92%	4.0	0.7
Clonus	11%	96%	2.7	0.9

worked for 2 months and was not performing any repetitive motions, yet symptoms were still worsening. Cervical radiculopathy was also unlikely as there were no radiating symptoms; and no myotomal, dermatomal, or other lower motor neuron signs were present. Hyperreflexia is an upper motor neuron sign that points to pathology of the central nervous system.[22] Lumbar spinal stenosis could explain lower extremity weakness, imbalance, and gait dysfunction but could not account for the upper extremity findings.[23] Other inflammatory or progressive neurological disorders could not be ruled out. However, all the symptoms could easily be explained by the diagnosis of CM.

Triage

Multiple factors relating to the potential source of myelopathy were considered to determine if this patient was appropriate for treatment, referral, or urgent referral. The patient showed no signs of infection. He had a history of skin cancer, however, radiographs taken 3 weeks previously showed no signs of any tumor. Although there was no traumatic injury, the patient was older than 65 and had osteopenia, a history of compression fractures, decreased cervical spine range of motion, and cervical spinous processes that were unable to be assessed for tenderness. Furthermore, the patient's symptoms had worsened since radiographs were taken, including new onset of gait imbalance. Therefore, a cervical spinal fracture could not be completely ruled out with confidence.[24] An attempt to contact the patient's physician at the geriatric specialty clinic was made but was unsuccessful. Therefore, it was recommended that the patient go to the emergency department for further evaluation based on clinician examination and new neurological symptoms consistent with an emergent progression of CM.

OUTCOMES

After discussing the examination findings and the associated risks with the patient and his wife, he decided to follow the physical therapist's recommendation and went to the emergency department the same day. He underwent magnetic resonance imaging of the cervical, thoracic, and lumbar spine that revealed severe spinal canal stenosis with spinal cord impingement at C5-6 attributable to degenerative cervical spinal canal narrowing. Neurosurgery was consulted in the emergency department and determined that urgent surgical intervention was not necessary. The patient was referred to rheumatology for further evaluation of inflammatory conditions. He was given an additional diagnosis of seronegative arthritis and began a trial of prednisone and methotrexate to address elevated inflammatory markers. Within 2 months following the medication regimen, his symptoms were completely resolved. Attempts to taper prednisone were unsuccessful with symptoms recurring once the medication was stopped. At one-year follow-up, the patient remained symptom-free on the same medication regimen.

DISCUSSION

Cervical myelopathy is a complex diagnosis that can masquerade as many other pathologies.[1] In this case, several of the patient's signs and symptoms fit the typical presentation of CM. The patient's report of numbness in the hands, loss of dexterity, clumsiness with gait, and the upper motor neuron sign of hyperreflexia are consistent with CM as reported by Cook et al in 2009.[16] However, multiple clinical tests that could have aided in the diagnosis of this patient were not used. In particular, Hoffman's Sign and the Babinski Sign could have been used as part of the diagnostic cluster described by Cook et al in 2010.[17]

Significantly, the patient also had signs and symptoms that are not commonly found with CM. For example, the patient had knee muscle weakness, diffuse pain throughout the lower extremities, and elevated inflammatory markers. These findings suggest that competing diagnoses, such as other inflammatory conditions should have been considered. Seronegative arthritis was possible but unlikely, given that the patient did not have joint-specific pain, but did have neurological symptoms such as numbness and ataxia. In this case, the resolution of neurological symptoms with anti-inflammatory medication could be attributed to decreased swelling from severe central canal stenosis compressing the spinal cord. Long-term follow-up would be useful for tracking the progression of this patient's condition. However, this information is not available and should be considered a limitation of this case report.

Clinical Application

In the early stages, CM is often misdiagnosed leading to progressive worsening of the condition and poorer outcomes.[10,13] Physical therapists can accelerate the time-sensitive diagnosis and management of CM by conducting a thorough examination and using sound clinical reasoning. A thorough review of medical history, detailed subjective history, a complete examination of upper and lower extremities, neurological assessment, and balance and gait assessment may be necessary to rule in and out competing differential diagnoses. The patient must also be evaluated as a whole person, rather than evaluating specific anatomic regions, as highlighted in this case. As autonomous practitioners, physical therapists must consistently perform red flag screenings and be able to determine when referral to another health care practitioner is necessary. In this case, referral to the emergency department expedited the diagnostic process and aided in appropriate medical management of this patient.

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Faculty Racial/Ethnic Make-up Among America's Top 40 DPT Program Website is Absent or Unclear: An Orthopedic Physical Therapy Perspective

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ABSTRACT

Background and Purpose: Approximately 35% of the U.S. population is a minority. This article aims to identify the percentage of DPT (Doctor of Physical Therapy) core faculty and program director/chairs who identify as minorities. **Methods:** An email including 2 survey questions inquiring about the faculty ethnic make-up was sent to the program directors/chairs of the top 40 physical therapy programs as identified by 2019 U.S. News and World Report. **Findings:** Seventeen of 44 programs responded (39% response rate). Approximately 14.7% (46/313) of the core faculty identify as minority and 1 out of the 17 programs (5.9%) has a minority program director/chair. **Discussion and Relevance:** The percentage of minority core faculty and program director/chair was below the percentage of minorities in the United States. **Conclusion:** An immediate change to consider is for the program director/chair to provide how many core faculty and leaders identify as minorities on their program website.

Key Words: diversity, equity, inclusion

BACKGROUND AND PURPOSE

When it comes to patients seeking musculoskeletal care, one size (of physical therapy care and education) does not fit all and one of the reasons is due to known racial health heterogeneity.[1] Racial health care disparities start early. For example, after an anterior cruciate ligament rupture, minority children experience a greater delay in surgery and receive less physical therapy.[2] Following this, 9 months after surgery, they had greater residual knee muscle weakness than non-minority children.[2]

A similar picture emerges in the middle to older age group; a national survey (NHANES III) found that black individuals have higher odds of reporting symptomatic knee osteoarthritis.[3] They tend to have weaker lower extremity strength than white women,[4] worse pain scores,[5,6] and poorer function pre-total knee arthroplasty (pre-TKA).[5,7] Despite these issues, they are less likely to use surgery, even if it is needed and appropriate.[8] This hesitancy may be due to individuals who are black having poorer pain outcome expectations and this perception of poorer post-op outcome is not unfounded.[6,9,10] While the root causes of these disparities are unknown, existing data inform us that a patient-provider relationship leading to improved trust would be beneficial.[11] It is pragmatic to believe that prehab and counseling from physical therapists, who themselves are minorities, may bridge this gap.[12]

This concept is supported by the APTA President, Sharon Dunn, PT, PhD, who stated that "health care professions should be as diverse as the populations they serve…".[13] One of the ways the APTA is monitoring its progress towards diversity equity and inclusion (DEI) is through research on the percentage of minorities that make up our leaders, educators, and incoming health professionals. Generally speaking, any group (ie, ethnic, racial, or religious) "having a distinctive presence within a larger society" can be defined as a minority.[14] The APTA's 2019-2021 Strategic Plan includes an objective to make the APTA an organization that reflects the diversity of society. Their current initiatives include plans to increase minority student recruitment, the Campaign for Future Generations to increase DEI funding, and creating a committee to continue the APTA's DEI efforts.[15] Currently, the U.S. population as a whole has approximately 35% of minorities.[16] In physical therapy programs across the United States, there is an increasing percentage of minorities in the past 3 years, from 23.9% in 2016 to 26% in 2019.[16] However, core faculty make up about 15% (415/2765) according to the Commission on Accreditation of Physical Therapy Education (CAPTE).[15] The U.S. News and World Report Annual Program Ranking carries a certain prestige and influence where potential students would refer when applying to physical therapy programs. Thus, this article aims to identify where the top 40 ranked DPT programs are in the percentage of core faculty and program director/chair who are minorities.

METHODS

The websites of DPT programs that were ranked within the top 40 according to the 2019 U.S. News and World Report were reviewed.[17] The data collected from the sites are publicly available online and were used to identify each program's faculty, director/chair, and credentials. Emails (**Appendix**) were then sent to program directors/chairs (February-March 2020) to verify our findings. If a response was not received, a second consecutive email was sent to the program director.

FINDINGS

Seventeen out of 44 programs responded (39% response rate). The results were similar to that of CAPTE: approximately 14.7% (46/313) of the core faculty identify as minority (**Table 1**). However, according to the CAPTE, 10.5% (25/239) of program directors/chairs are minorities,[16] while the current findings show this to be true for only 1 of the 17 leading programs (5.9%) (**Table 1**).

DISCUSSION AND RELEVANCE

Our main findings indicate that nearly two-thirds of the top-ranked 40 programs did not respond to our request to participate in this study. Based on the current findings, the percentage of physical therapy program faculty and program director/chair who identify as members of the minority race/ethnicity is well below the national percentage of the U.S. population and is also well below the percentage of minority core faculty in medical schools, which exceeds the percentage of the U.S. population. It can be argued that this lack of diversity creates a chain effect due to potential minority students are more inclined to apply if there are minority faculty in a DPT program.[18]

The American Physical Therapy Association (APTA) has a long history of supporting physical therapy programs with minority initiatives, recognizing them with the Minority

Table 1. Minority Faculty Leaders/Members of the Top 40 DPT Program in 2019 vs CAPTE and APTA

Resource	Summary of Key Findings
Current Study	% of Minority DPT Core Faculty: 14.7% (46/313) % of Minority DPT Directors/Chairs: 5.9% (1/17)
CAPTE[16]	% of Minority DPT Core Faculty: 15% (415/2765) % of Minority DPT Directors/Chairs: 10.5% (25/239)
APTA[19]	# of Minority Initiative Awards Given in past 21 years: 7

Initiative Award. It is important to note that the APTA has given this award to 7 programs in the past 21 years (**Table 1**).[19] It is reasonable to speculate that not enough programs apply due to not meeting the requirements. In turn, programs do not meet the requirement because there is no CAPTE mandate, no minority program leader, lack of minority faculty mentoring,[20] and no institutional support.[21] This may in part be due to lack of awareness or perspective attuned to the needs of having a minority faculty in their midst or there are not enough qualified minority faculty who join their ranks.

Doctor of Physical Therapy websites can display what actions they have taken to promote a sustainable DEI program as advocated by the University of Delaware Dean, Gregory Hicks in his inaugural Lynda D. Woodruff Lecture this year.[22] In 2009, the medical school accreditation body mandated Liaison Committee on Medical Education (LCME) MS-8. This document states medical schools must develop an institutionalized pipeline programs, collaborate with institutions serving minorities, increase career awareness and academic enrichment pre-MD programs.[23] The LCME IS-16 advocates that programs develop policies and practices to systematically engage in focused efforts to attract and retain minority faculty/staff.[23] A systematic review by Rodriguez et al affirmed the value of these mandates.[24] Prior to the mandate, there were disparities in recruitment and retention of academic faculty.[25] Less than 10 years following the LCME policy changes, medical school graduates (41.1%) and faculty (36.1%) have exceeded the percentage of minorities in their midst as the U.S. general population (35%) in 2018.[24] The LCME mandates did not include promotion of faculty and minorities continue to struggle in getting promoted at the highest levels in academic medicine.[26-29] Similar to medicine, the physical therapy profession may benefit from such mandates (which must include promotion, not just recruitment and retention) from CAPTE to effect systemic change at the institution level. For example, at the professional service level such as AOPT, bylaw changes to include mandated inclusion and mentoring of minorities to advance their leadership roles within our profession may be warranted.

CONCLUSION

Information about the faculty racial/ethnic among America's 2019 top 40 DPT program website is absent. The authors suggest that one immediate change is for physical therapy programs to state on their website how many of their faculty leaders and members are minorities.

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Appendix. DEI Email

Subject Line: PT Diversity Equity and Inclusion Initiative

Dear Dr. _____

As DPT students at Sacred Heart University, we would like to find out where the leading physical therapy programs are in terms of diversity, equity, and inclusion (DEI). In particular, we are looking to gather information that is accessible in the public domain through the DPT program website regarding the racial/ethnic makeup of the core faculty for a potential APTA newsletter article (i.e. PT in Motion). This article is meant to contribute to APTA's DEI initiatives.

The APTA's effort to encourage greater diversity involves seeking congressional financial support to increase minority representation in PT due to the fact that the racial/ethnic makeup of PTs does not reflect the racial/ethnic makeup of the US. The current APTA president, Sharon Dunn, PT, PhD stated in a recent PT in Motion Newsletter that "the idea that health care professions should be as diverse as the populations they serve is an important one for APTA, and this legislation is a welcome step in the right direction."

https://apta.org/PTinMotion/News/2019/10/29/DiversityBillHouse/?category=New%20in%20Research&blogid=10737418615

We believe that this effort will be successful if there are enough PT faculty and program chairs/leaders who serve as role models and faculty advisors for PT students. Therefore, we are kindly asking for two pieces of information regarding the racial/ethnic makeup of your department:

1. How many of your [***insert # of core faculty***] core faculty is of racial/ethnic minority?
2. Is your program director/chair or associate program director/chair a racia/ethnic minority? ***Yes/No***

Below is the list we've compiled for the core faculty at your institution based on the department's website.

[Table Including Faculty Name, Credentials, and Role in PT Department]

Thank you for your time.

Respectfully,
Jake Tavernite, SPT
Nicole Morris, SPT

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Meet Your Newly Elected Leaders

- **President:** Bob Rowe, PT, DPT, DMT, MHS, FAAOMPT

- **Director:** Annette Karim, PT, DPT, PhD, OCS, FAAOMPT

- **Nominating Committee Members:** Caroline Brunst, PT, DPT, SCS, OCS, ATC (1-year term)

Paul Mintken, PT, DPT, OCS, FAAOMPT (3-year term)

The Effects of Stretching versus Static and Dynamic Cupping on Lumbar Range of Motion: A Randomized Control Trial

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ABSTRACT

Background and Purpose: Cupping therapy is a manual therapy technique that suctions and distracts tissues. The purpose of this study was to examine whether static or dynamic cupping is more effective than stretching at increasing lumbar range of motion (ROM). **Methods:** Forty-five asymptomatic participants with limited lumbar ROM were placed into a stretching control group or 1 of 2 intervention groups: static cupping or dynamic cupping to the lumbar paraspinal muscles. All groups received intervention for 8 minutes. Lumbar flexion ROM and active SLR measurements were collected at pre-intervention, post-intervention, and 24-hour follow-up. **Findings:** No clinical significance was found for lumbar flexion ROM or ASLR. **Clinical Relevance:** Cupping therapy should not be used as a standalone intervention to increase lumbar ROM. **Conclusion:** Static and dynamic cupping to the lumbar paraspinal muscles was not more effective than stretching at increasing lumbar ROM.

Key Words: manual therapy, mobility, stiffness

INTRODUCTION

Background and Purpose

Cupping therapy received worldwide recognition during the 2016 Olympics when athletes appeared with dark circles dispersed across their bodies.[1] This bolstered the popularity of the technique throughout Western cultures; however, there is insufficient quality evidence that cupping has a significant effect on musculoskeletal conditions.[1,2] The literature pertaining to cupping suggests positive effects of tissue distraction and mobilization for a variety of conditions, including low back pain (LBP). Low back pain is associated with limited lumbar range of motion (ROM), and these impairments are linked to decreased functional status, decreased independence, and increased fall risk.[3-5]

According to the Low Back Pain Clinical Practice Guideline by Delitto et al, patients with LBP with mobility deficits benefit from both therapeutic exercise and manual therapy.[6] It has been demonstrated that therapeutic exercises emphasizing spinal flexion and extension can improve lumbar ROM in patients with chronic LBP.[7] Stretching programs targeting trunk muscles have also shown increased spinal mobility in older adults, specifically trunk flexion and extension.[8] Furthermore, stretching is a technique that has been used to increase lumbar ROM in patients with lumbar mobility deficits and hamstring tightness.[9] A study by Bandy et al demonstrated that greater gains in flexibility can be made through a stretching program as compared to other forms of dynamic ROM interventions.[10] Nelson and Bandy argued that stretching should be considered the "gold standard" for increasing lumbar ROM.[11]

Authors have shown that stretching programs can increase muscle extensibility and/or increase stretch tolerance of targeted muscles. Authors suggest that the greatest change in motion occurs with stretches between 15- and 30-second holds for between 2 to 4 sets.[8,12] One proposed mechanism by which stretching increases flexibility includes increasing stretch tolerance, and this increased ROM is linked to decreased pain, increased viscoelastic properties of tendons, and increased amount of sarcomeres in muscle fibers.[8,13] Although authors agree that stretching can significantly improve lumbar ROM, others suggest further methods of increasing ROM should be considered.[14] Ultimately, more research needs to be completed to determine the most effective method to increase lumbar ROM.[11]

Other techniques that have been shown to significantly increase lumbar ROM include soft tissue mobilization and instrument assisted soft tissue mobilization (IASTM). Researchers used these techniques on the muscles of the lumbar spine and found significantly increased lumbar ROM in patients with sciatic and LBP.[15,16] Cupping has been proposed to have similar effects as other soft tissue mobilization techniques.[17] Authors have found significant improvements in visual analog scale scores, active SLR measures, lumbar flexion ROM, and pain-pressure threshold as a result of cupping; however, studies investigating this were limited by a small sample size and lack of a control group.[18] Therefore, a gap remains in the literature regarding the efficacy of cupping therapy on improving ROM.

It should be noted that practitioners commonly use 2 cupping techniques—static cupping and dynamic cupping.[19] Static cupping involves the application of a negative pressure cup to the desired location for an extended period of time.[19] In contrast, dynamic cupping involves the application of a negative pressure cup to the skin followed by moving the cup across the surface of the skin.[19] Although both methods of cupping have been theorized to increase the elasticity of the underlying tissues, the inadequate quantity and quality of research available makes it difficult to accurately determine the efficacy.[17]

Based on the lack of consistency, small sample sizes, and insufficient amount of literature, the current study intended to cover gaps in existing literature on the topic. The study included a larger sample size, standardized cupping parameters, and detailed information on the procedures for each outcome measure. The purpose of this study was to examine whether static or dynamic cupping is more effective than stretching at increasing lumbar ROM.

METHODS

Participant Selection

Participants were recruited from the University of South Carolina by word of mouth. Interested participants were contacted with information relevant to the study, including inclusion and exclusion criteria. Local clinicians affiliated with the Doctor of Physical Therapy program were contacted verbally, one-on-one, or in staff meetings to recruit participants. Inclusion criteria were that participants had to be 18 years or older with 50° or less of true lumbar flexion ROM as measured via the Back Range of Motion Instru-

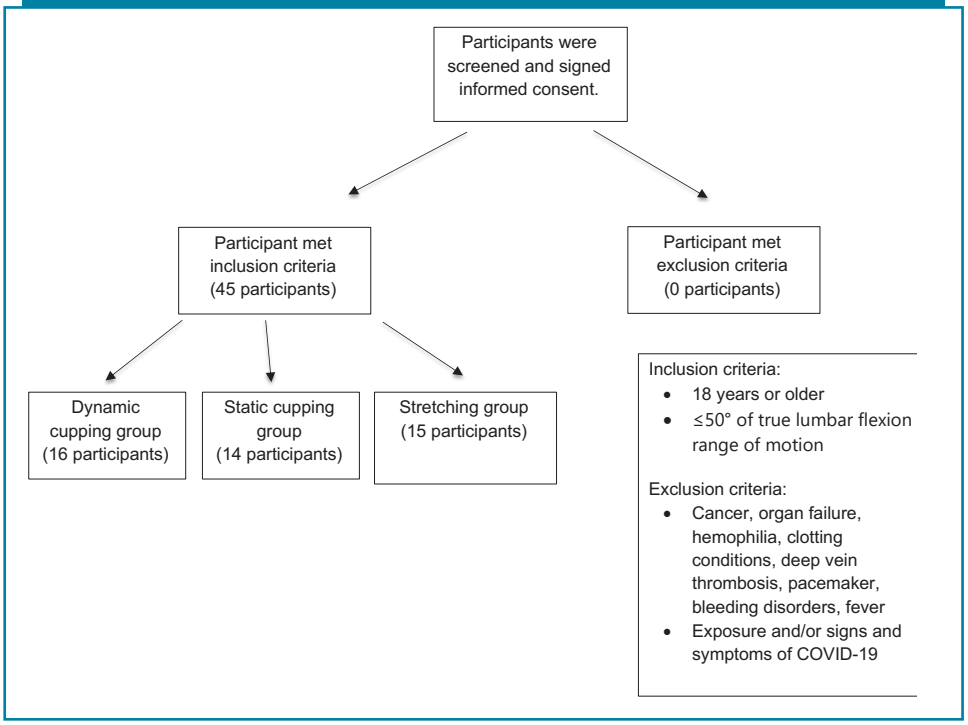
ment (BROM II) device (© Performance Attainment Associates). Lumbar flexion of 50° or less was considered limited for this study as the normative value of lumbar flexion is 60°.[20] Participants filled out an exclusion form upon initial arrival, and those with any known history or diagnosis of cancer, organ failure, hemophilia, clotting conditions, deep vein thrombosis, pacemakers, bleeding disorders, collagen disorders, and/or recent fever were excluded from the study as these are contraindications to cupping. They also completed a form about known exposure or current signs and symptoms of COVID-19. Participants that met the inclusion criteria and chose to participate signed an informed consent form and were made aware that they could opt out of the study at any time. All procedures of the current study were approved by the University of South Carolina Institutional Review Board.

Once recruited, 45 participants without LBP were equally dispersed into 3 treatment groups via stratified randomization by rolling a die. These groups included a dynamic cupping group, a static cupping group, and a stretching group. All examiners, except those performing the intervention, were blinded to the group assignment for all participants, as they did not know which numbers on the die corresponded to which intervention. A licensed Physical Therapist also grouped participants based on ROM limitations: those with 35-50° of lumbar flexion (mild), 20-34° (moderate), and less than 20° (severe). This stratification ensured participants with similar ROM limitations were equally represented across treatment groups. To ensure that participants were evenly dispersed throughout the intervention groups with respect to the severity of their limitation, each participant rolled a die to determine which of the three intervention groups they were placed in.

Intervention Group Design

Group A (16 participants) received dynamic cupping applied bilaterally to the lumbar paraspinal muscles for 8 minutes. Group B (14 participants) received static cupping applied bilaterally to the lumbar paraspinal muscles for 8 minutes. Group C (15 participants) performed stretching of the erector spinae muscles for a total of 8 minutes. All participants received standardized instructions prior to measurement and intervention to ensure uniformity so that future studies can replicate the methodology and procedures. Demographics are provided in **Figure 1**.

Figure 1. Breakdown of Group Distribution Along with Inclusion/Exclusion Criteria



Outcome Measures

Measurements of Numeric Pain Rating Scale, lumbar flexion ROM, active SLR, and pain pressure threshold were performed respectively at pre-intervention, post-intervention, and at 24-hour follow-up. At the end of the follow-up session, participants were given the Global Rating of Change to determine self-perceived change in the lumbar region over 24 hours. The term "change" was used rather than "pain" or "motion" to allow for participant subjectivity. This scale was used as an exploratory measure to provide insight into self-perceived effects of cupping; therefore, statistical analysis was not performed on this measure. This research study specifically focused on the effects of cupping and stretching on ROM rather than pain, thus the primary focus was on the BROM II and active SLR (ASLR) outcome measures.

Lumbar flexion ROM was obtained with the BROM II instrument. Authors have shown that the BROM II is comparable to the double inclinometer, and it is efficient and easier to measure lumbar flexion.[21] This measure has been found to be highly reliable and valid in assessing lumbar ROM.[21] To begin the procedure, lumbar flexion was verbally instructed to each participant, with emphasis placed on smooth and steady motion to end range. The S1 vertebral level was palpated and marked for each participant by one student physical therapist. Prior to the initiation of the current study, the student physical therapist was tested on consistency of palpating and locating vertebral levels by her instructor. The BROM II was placed on the sacrum, with the pivot point at S1. Velcro straps were stretched across the lower abdomen, with a downward pull to maintain firm contact between the instrument and the sacrum throughout the movement.

Participants stood erect with feet shoulder width apart. The T12 vertebra was palpated, and the moveable arm was placed to measure the distance between T12 and S1. The reading on the sliding scale was recorded, and this was used to position future measurements to assure that the same segment was measured at each time point. The arm tip was then removed from T12 and an examiner placed a finger firmly over the T12 marking. The participant then slowly bent forward as if they were to place their palms flat on the floor. When the participant reached end range, the arm tip was replaced on T12 so that an angular distance reading could be taken. This motion was then repeated twice more, and scores were averaged.[22]

An active SLR measure was included to provide insight on if cupping and/or stretching of the lumbar paraspinals has an effect on hamstring flexibility. This test involved the participant actively raising the leg as far as possible without compensation of knee flexion. When the participant's knee began

to bend, the leg was slightly relaxed into the recorder's hand until straight again, then the measurement was taken. The active SLR was measured using a standard goniometer that was masked by a piece of paper covering the marked lines and degrees to ensure the grader was blinded. The grader read the instructions prior to initiation of the test, and the recorder, one third-year student physical therapist, ensured the non-tested leg was in contact with the plinth throughout the test. The goniometer was placed on the superior half of the greater trochanter (axis), with the stationary arm parallel to the edge of the table and the moving arm along the lateral midline of the thigh. After raising the leg, the heel of the raised leg was relaxed into the recorder's hand at end-range prior to measurement being taken. The goniometer was then removed after the measurement was taken, the piece of paper was lifted away from the goniometer, and the recorder read and documented the measurement. This was repeated twice more, and scores were averaged.[23-25]

Treatment Groups

Participants in the dynamic cupping group were asked to lie prone on the plinth with a pillow placed under the abdomen while lotion was applied bilaterally to lumbar paraspinals to protect the skin from friction and allow for adherence of the cup to the skin. The cups used for treatment were 5.6-cm KangZhu cups.[18] Cups were placed just lateral to the L1 and L5 spinous processes. Participants' hand width was measured and marked lateral to the spinous processes bilaterally to demarcate a standardized treatment area across participants. Following lubrication, two cups were applied bilaterally, and suction was applied to raise skin to a comfortable pressure as deemed by each participant. Once the cups were properly applied, the researcher moved them continuously in a sweeping motion between L1 and L5 within the defined width bilaterally for a total treatment duration of 8 minutes.

The static cupping group underwent the same initial placement of the cups as the dynamic cupping group to ensure standardization. Following lubrication, 4 cups were applied bilaterally to the lumbar paraspinals at the aforementioned points, raising skin to a comfortable pressure as deemed by each participant. Cups remained on the treatment area statically for 8 minutes prior to removal.

The stretching program performed by the control group consisted of pelvic tilts, double knee to chest stretch, and cat and camel stretches. Instructions and duration for each stretch are detailed in **Table 1**.[26] Participants received a 30 second rest break between each of the four stretches for a total of 8 minutes.

Data Analysis

A power analysis was performed based on estimated effect size of 0.25, power of 0.80, and alpha of 0.05 to determine a need for 45 participants in this study. A Shapiro-Wilk test was performed on collected data to determine normalcy prior to analysis. The Shapiro-Wilk test was chosen over the Kolmogorov-Smirnov (K-S) test due to the sample size of the study and to provide better power. A one-way ANOVA was run first to determine whether the 3 groups differed in lumbar ROM and ASLR at baseline, followed by a 3x3 ANOVA (mixed model, repeated measures) within group factor and a between group factor. This repeated measures ANOVA was used to determine if there were differences between intervention groups regarding lumbar ROM and ASLR at pre-intervention compared to post-intervention and follow-up. Partial eta squared ($\eta 2$) was used to estimate the effect size ($\eta 2$ of 0.01-0.059= small effect; 0.06-0.139= medium effect; ≥0.14= large effect).[27] All changes in ROM were interpreted relative to published minimal detectable change (MDC) values. These values allow researchers to confirm that any noted change is true change rather than due to measurement error. These MDC values were defined as 4.53° for the left ASLR, 4.68° for the right ASLR, and 2.5° for lumbar flexion ROM.[24,28,29] Analysis of data was conducted through IBM SPSS 27 Statistics software. Alpha was set to $p<0.05$.

RESULTS

Forty-five participants with lumbar flexion limitations met the inclusion criteria, and there were no dropouts in the study. **Table 2** provides descriptive data of the participants for the current study (N=45). **Table 3** provides ranges of lumbar flexion ROM. Moderate limitations in lumbar flexion ROM defined as 20-34 were most common across the participants. **Table 4** provides one way ANOVA results between groups that did not differ at baseline.

A mixed-model ANOVA was performed to compare left ASLR, right ASLR, and lumbar flexion ROM across time (pre-intervention, post-intervention, and at 24-hour follow-up) and by group (dynamic cupping, static cupping, and stretching groups).

Table 1. Control Group Stretching Exercises

Stretch	Instructions	Duration
Pelvic Tilt	Lying on your back, bend your knees so that your feet are flat on the table. Tighten your abdominal muscles and flatten your back into the table.	4 times for 30 seconds
Cat Stretch	In a quadruped position, align your hands under your shoulders and knees under your hips. Drop your head down while tucking your hips under and raising the middle of your back.	4 times for 30 seconds
Camel Stretch	In a quadruped position, align your hands under your shoulders and knees under your hips. Raise your head up while raising your hips and allowing your stomach to fall towards the table.	4 times for 30 seconds
Double Knee to Chest	Lying on your back, bring your knees into your chest. Clasp your hands under your knees. Hold stretch at end range.	4 times for 30 seconds

Table 2. Descriptive Data of the Participants in the Current Study (N=45)

	Group A (Dynamic Cupping)	Group B (Static Cupping)	Group C (Stretching)
Male	5	5	6
Female	11	9	9
Total (N)	16	14	15
Average Age= 26.6, Standard Deviation 7.95			

Table 3. Lumbar Flexion Range of Motion Limitations

Limitation Category	Number of Participants
Mild (35-50°)	19
Moderate (20-34°)	25
Severe (<20°)	1

Table 4. Difference Between Groups for Measurements at Baseline

Baseline Measurement	P values
Lumbar Flexion Range of Motion	p=0.785
Left Active Straight Leg Raise	p=0.154
Right Active Straight Leg Raise	p=0.168

Table 5. Change Scores in Degrees Across Time

Left ASLR:			**MDC=4.53**
	Pre-Intervention to Post-Intervention	Post-Intervention to Follow-up	Pre-Intervention to Follow-up
Dynamic cupping	+1.68	+0.35	+2.15
Static cupping	-1.08	+1.07	-0.01
Stretching	+2.62	+1.07	+3.13
Right ASLR:			**MDC=4.68**
	Pre-Intervention to Post-Intervention	Post-Intervention to Follow-up	Pre-Intervention to Follow-up
Dynamic cupping	+1.83	-0.18	+0.39
Static cupping	-1.02	+2.31	+1.29
Stretching	+2.68	-0.15	+2.51
Lumbar Flexion:			**MDC=2.5**
	Pre-Intervention to Post-Intervention	Post-Intervention to Follow-up	Pre-Intervention to Follow-up
Dynamic cupping	-0.39	-0.95	-1.34
Static cupping	-0.24	-1.26	-1.50
Stretching	+2.13	-2.98	-0.85

Abbreviations: ASLR, active straight leg raise; MDC, minimally detectable change

Table 6. Statistical Data of Effect of Time and Across Groups for Each Outcome Measure

	Lumbar Flexion Range of Motion	Left Active Straight Leg Raise	Right Active Straight Leg Raise
Effect of time	0.111	0.044*	0.002*
Effect across groups	0.538	0.251	0.269

*significant value

Table 5 provides change scores in degrees for all measures across time. **Table 6** provides data of the effect of time and across groups for each outcome measure. An effect of time was found for the left ASLR measurement ($p=0.044$, $\eta 2 = 0.141$) but no statistical significance was found across groups (dynamic cupping, static cupping, and stretching groups; $p=0.251$, $\eta 2 = 0.064$). The change scores for each group across time fell below the MDC of 4.53°. An effect of time was found for the right ASLR measurement ($p=0.002$, $\eta 2 = 0.257$), but no statistical significance was found across groups ($p=0.269$, $\eta 2 = 0.061$). Change scores for each group across time fell below the MDC of 4.68°. There were no statistically significant differences across groups for lumbar flexion ROM ($p=0.538$, $\eta 2 = 0.029$). **Figures 2-4** demonstrate the average measurements of left ASLR, right ASLR, and lumbar flexion ROM for groups. As all changes found were smaller than the MDC, further analysis was not performed between specific time points. Raw data is presented in **Table 7**.

Discussion

This study examined the effect of static cupping and dynamic cupping to the lumbar paraspinal muscles on lumbar ROM when compared to stretching. None of the groups gained a significant amount of lumbar ROM after receiving any of the 3 interventions. Interestingly, although not statistically significant, both cupping groups had a loss of active lumbar flexion when comparing the means of any 2 time points.

For the ASLR measure, a statistically significant effect of time in both the right and left ASLR measurements was observed. However, the amount of ROM increase across time points fell within the MDC, making the results clinically irrelevant. There were no significant differences between groups, indicating that participants were just as likely to have increases in ASLR measurements regardless of the intervention. This suggests that cupping the lumbar paraspinals should not be used as a stand-alone intervention to increase the ASLR.

Markowski et al examined the effect of static cupping to the bilateral lumbar paraspinal muscles on lumbar ROM; however, this study had multiple limitations, including lack of a control group, a small sample size (n=17), and absence of raw data or comparison to an MDC for clinical significance.[18] The current study addressed and improved these limitations to more accurately address the potential benefits of cupping on lumbar ROM. Inclusion of a control group allowed for comparison of results between different groups and the ability to isolate variables. Also, the current study included a third timepoint 24 hours after the initial test to observe if any changes in ROM were maintained over time. The current study used the BROM II instrument to measure lumbar specific ROM.

Markowski et al found a significant increase in active lumbar flexion ROM after static cupping.[18] As mean values over time were not reported, it is not possible to compare any specific data between studies. There is also an inability to determine if true change was present in the Markowski et al study, as no data were compared to the MDC. One unique difference between studies is that Markowski et al required LBP as an inclusion criterion for their participants, while the current study did not.[18] This may have impacted results, as the mechanism of cupping to increase lumbar ROM may be due

Figure 2. Average Left Active Straight Leg Raise Measurements for All Groups Across Time

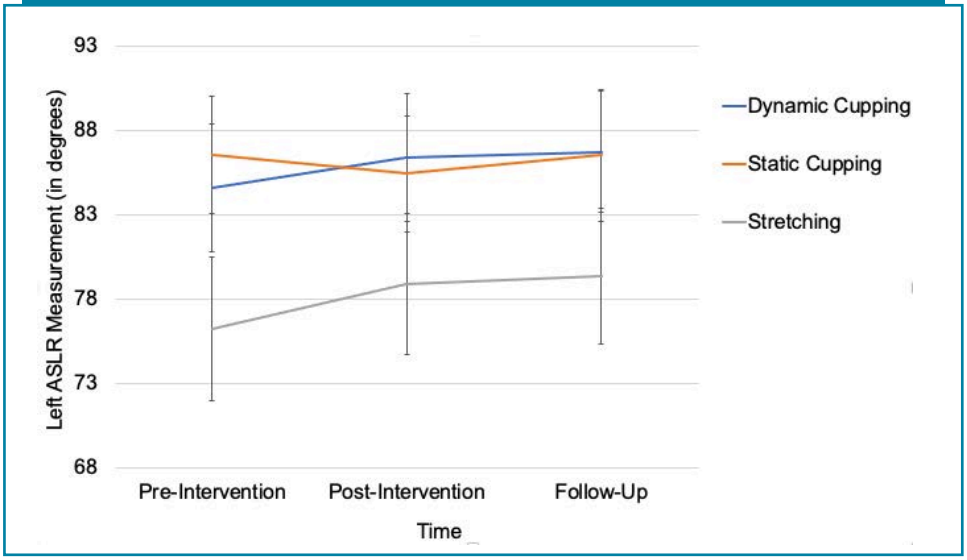


Figure 3. Average Right Active Straight Leg Raise Measurements for All Groups Across Time

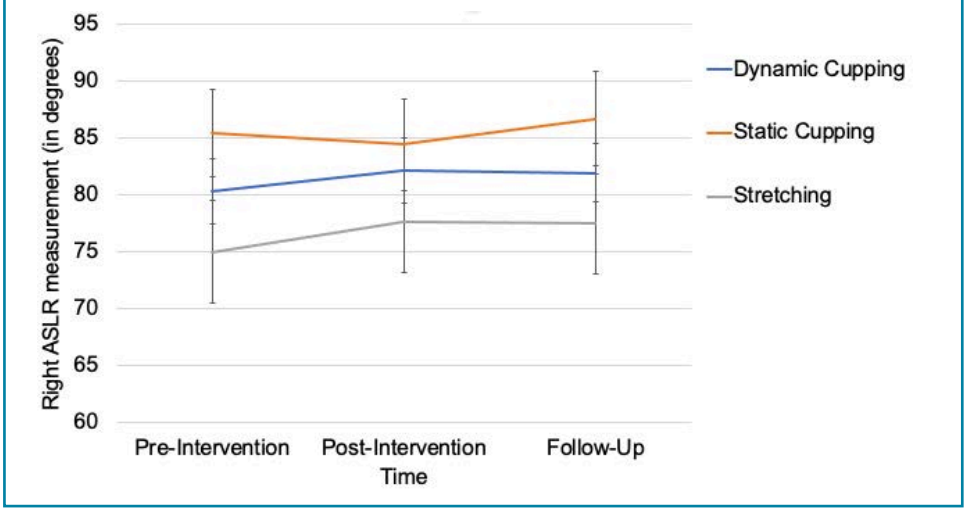
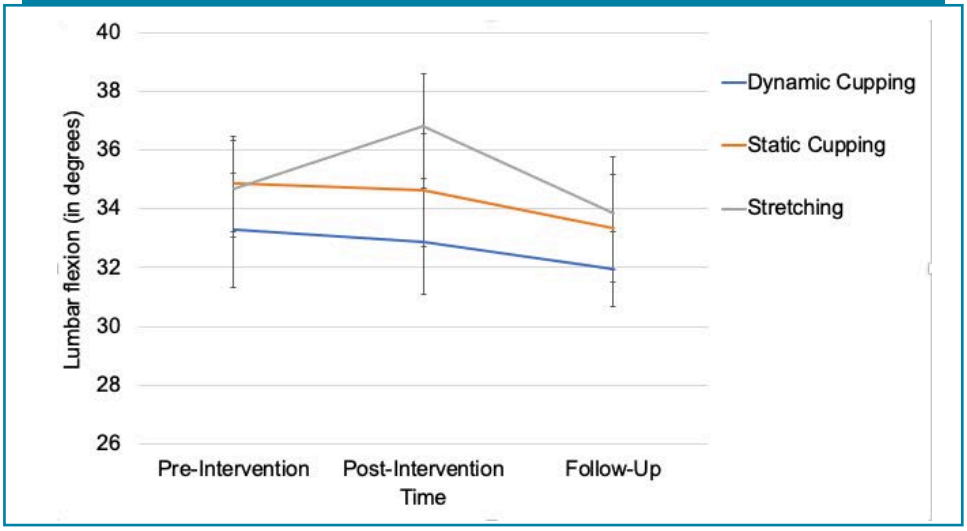


Figure 4. Average Lumbar Flexion Measurements for All Groups Across Time



to a neurophysiological pain modulation effect.[13,17,18] If cupping therapy modulates pain and relieves tension, this could explain why Markowski et al observed a significant increase in lumbar ROM while the current study did not.

Limitations

There were several limitations regarding the use of the BROM II. First, all participants that were screened fit the inclusion criteria of the study, as the BROM II specifically measures lumbar spine ROM. For example, several participants were very flexible with forward flexion, but when evaluated by the BROM II, they had a lumbar loss of ROM as their movement came from the hips, shoulders, and thoracic spine. Second, securing the device on the sacrum required 2 tightly secured Velcro straps around the waist, which participants noted as painful or uncomfortable and may have prevented them from reaching end range flexion. Third, use of the BROM II involves palpation of the T12 and S1 vertebrae by an examiner to ensure the same spinal segment was measured for each time point. It is possible there was a degree of inaccuracy in these palpations or varied accuracy between participants; however, the student physical therapist responsible for palpation was tested on consistency of palpating and locating vertebral levels by her instructor prior to initiation. The static and dynamic cupping therapy interventions involved lubrication of the skin, making it difficult to prevent the BROM II from sliding across the skin upon post-intervention measurement. This was a limitation, as accurate ROM measurement requires the device to be secure and stationary on the sacrum. Finally, placement of the BROM instrument involved exposure of the low back region, thus researchers taking these measurements were able to see bruising from the cupping treatment when measuring lumbar ROM post-intervention and at 24-hour follow-up. While the BROM II requires a very standardized means of measurement, this did lead to difficulty blinding.

There were also limitations with the use of the ASLR. Despite cueing, several participants compensated with knee flexion as the leg was raised, or there was movement of the non-tested limb when it should have remained stationary on the plinth. The measurements were taken by an examiner with a standard goniometer, which is subject to a degree of human error. Additionally, the goniometer was masked to the examiner and moved from the tested limb in order for the measurements to be read and recorded by

Table 7. Mean Measurements for All Groups Across Time

Left Active Straight Leg Raise:			
	Dynamic Cupping	Static Cupping	Stretching
Pre-intervention	84.60°± 15.16°	86.53°± 12.96°	76.27°± 16.52°
Post-intervention	86.40°± 15.20°	85.45°± 12.87°	78.89°± 16.18°
Follow-up	86.75°± 14.24°	86.52°± 14.68°	79.40°± 15.59°
Right Active Straight Leg Raise:			
	Dynamic Cupping	Static Cupping	Stretching
Pre-intervention	80.27°± 11.44°	85.38°± 14.42°	74.96°± 17.34°
Post-intervention	82.10°± 11.39°	84.36°± 14.93°	77.62°± 17.20°
Follow-up	81.92°± 10.45°	86.67°± 15.63°	77.47°± 16.98°
Lumbar Flexion:			
	Dynamic Cupping	Static Cupping	Stretching
Pre-intervention	33.29°± 7.77°	34.86°± 6.10°	34.69°± 6.39°
Post-intervention	32.90°± 7.21°	34.62°± 7.19°	36.82°± 6.98°
Follow-up	31.95°± 5.14°	33.36°± 6.83°	33.84°± 7.46°

another examiner. During this process, the arms of the goniometer could have slipped or shifted, changing the measurement.

A potential limitation for the static and dynamic cupping groups was the pressure of the cups being determined by participant tolerance rather than a standard pressure. This means the pressure varied from person to person, which could have impacted the effect of cupping.

Future studies should consider including a diverse participant population, as the mean age of participants was 26.6, and only one participant with severe ROM limitations was included. Based on limitations, future studies should consider using a different device to measure lumbar ROM due to the discomfort associated with the BROM II device. Future studies should also consider comparing the impact of cupping on participants with limited lumbar ROM both with and without pain, as the neurophysiological effect of cupping may lead to an increased lumbar ROM in participants with LBP. Finally, future studies should consider comparing the effect of cupping on lumbar ROM to other modalities, such as IASTM, which have been well documented to increase lumbar ROM.

CONCLUSION

This is one of few studies to evaluate the effect of static and dynamic cupping on lumbar ROM and active SLR measurements. Previous authors have suggested the use of cupping to increase lumbar ROM; however, this study showed no significant effect of static and dynamic cupping on lumbar ROM compared to stretching. Furthermore, this study demonstrated an increase in right and left ASLR measurements over time; however, the results fell below the MDC values, suggesting no true change. Further research should be performed to compare the effect of cupping on patients with and without low back pain.

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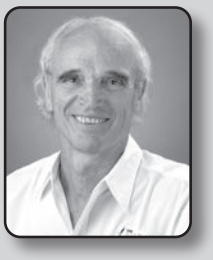

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Theoretical Framework for a New Subacromial Pain Syndrome Classification System

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ABSTRACT

Background and Purpose: Shoulder pain is one of the more common musculoskeletal pain conditions of the upper extremity, affecting up to two-thirds of individuals in their lifetime. Attempts to determine an anatomical structure responsible for the wide spectrum of shoulder pain have been generally ineffective. With the lack of a tissue source to ascribe to a patient's pain, clinicians are left with the broad clinical diagnosis of "Subacromial Impingement Syndrome (SIS)". The search for a tissue-based, pain-generating pathoanatomical source has numerous limitations and fails to guide physical therapy intervention. For these reasons, the umbrella term of "Subacromial Pain (SAP) Syndrome" is recommended to best label these non-traumatic, non-specific shoulder pain disorders. **Clinical Relevance:** The authors propose a classification system based on clinical findings to categorize patients into the following classifications: SAP with overuse/overload, SAP with movement coordination deficits, SAP with muscle performance deficits, and SAP with mobility deficits. Once a patient with SAP is evaluated, they may then be classified into one or more classifications based on their identified functional impairments. The clinician can then effectively administer matched interventions based on identified impairments.

Key Words: impairments, painful arc, shoulder

Shoulder pain is one of the more common musculoskeletal pain conditions of the upper extremity,[1] affecting up to two-thirds of individuals in their lifetime.[2] In an attempt to determine an anatomical structure responsible for the wide spectrum of shoulder pain, over 120 special tests have been developed;[3,4] despite the myriad of available tests, a pathoanatomical source of pain is often difficult to identify. Despite a painful arc between 60° and 120° of shoulder abduction as a characteristic sign of shoulder impingement, there is limited support for the biomechanics of compression. With the lack of a tissue source to ascribe to a patient's pain, one is left with the broad clinical diagnosis of "Subacromial Impingement Syndrome (SIS)."

Historically, since Dr. Neer's theoretical proposal in 1972, it has been assumed that the supraspinatus tendon was the primary structure being impinged within the subacromial space.[5] However, more recent imaging studies question if this is the case.[6] In a recent study, the investigators report that by 90° of humerothoracic elevation or 60° glenohumeral elevation, the supraspinatus tendon has already cleared the coracoacromial arch and is no longer at risk for compression.[7] Others also support that after 70° of arm elevation, the supraspinatus tendon is no longer positioned under the acromion or the coracoacromial ligament.[8,9] This might explain the poor post-surgical outcomes in patients who did not benefit from rehabilitation and cortisone injections. Patients were divided into 1 of 3 groups: arthroscopic subacromial decompression surgery, a sham arthroscopy, and no treatment.[10] The surgical groups (decompression and sham) had similar outcomes at both 6 and 12 months but did not show clinically important differences compared to the no treatment group.[10]

Research questioning the role of the acromion as the culprit dates back 25 years ago, suggesting other structures (eg, posterosuperior labrum) as possible sources of compression or injury to the supraspinatus tendon or other internal glenohumeral structures in the overhead athlete.[11] If some form of internal impingement exists, it is likely due to a variety of impairments including posteroinferior shoulder tightness (e.g., teres minor, infraspinatus muscles, joint capsule) as well as other mobility, motor control, muscle strength, and muscle endurance deficits rather than purely a pathoanatomic source.[12-14]

The search for a tissue-based, pain-generating pathoanatomical source has numerous limitations and fails to guide physical therapy intervention.[15,16] In similar conditions where the underlying pathoanatomical source cannot be identified, a spectrum of region-specific symptoms is referred to as a syndrome (eg, patellofemoral pain syndrome). The term 'syndrome' is frequently used to describe a cluster of clinical findings that commonly occur together with a heterogenous or unknown, underlying pathogenesis.[6] The umbrella diagnosis of "Subacromial Pain Syndrome" (SAPS) has been recommended to label the non-traumatic shoulder disorders that include (1) impingement, (2) subacromial bursitis, (3) calcific tendinitis, (4) biceps tendinitis, (5) rotator cuff degeneration, (6) supraspinatus and rotator cuff tendinopathy, and (7) partial rotator cuff tear.[3,6]

Subacromial shoulder pain is associated with incomplete recovery and pain with arm elevation and shoulder external rotation that limits function.[17] With consideration of the aforementioned 7 possible sources of pain, which is not by any means a comprehensive list, identifying an anatomical source for symptoms and determining associated pathomechanics can be challenging. The diagnostic label of SAPS simply implies certain functional impairments in the shoulder while making no assumptions about the anatomical source(s) of pain. A wide spectrum of dysfunction that is encompassed within the label of SAPS could perhaps lead to ineffective, non-specific treatment strategies. The authors recommend that classification of patients with SAPS into impairment-based categories would better guide therapeutic interventions that may ultimately lead to better patient outcomes.

The American Physical Therapy Association (APTA) and the Academy of Orthopaedic Physical Therapy (formerly the Orthopaedic Section) recommend using the International Classification of Functioning (ICF), Disablement, and Health as a framework to further subclassify patients with these non-specific pain conditions.[18-20] Childs et al first attempted to classify patients with non-specific mechanical neck pain into classification categories.[21] In the 2008 Clinical Practice Guideline (CPG) for Neck Pain published in the *Journal of Orthopaedic and Sports Physical Therapy (JOSPT)*, neck pain was classified into 4 impairment-based categories: Neck pain with mobility deficits, neck pain with movement coordination impairments, neck pain with headache, neck pain with radiating pain.[19] The revised Neck Pain

CPG published in 2017 further subclassified patients within each category into acute, subacute, and chronic pain populations.[18] In 2019, the *JOSPT* published a CPG for patellofemoral pain (PFP). The PFP CPG classifies patients into 4 categories: Overuse/overload without other impairments, PFP with movement coordination deficits, PFP with muscle performance deficits, PFP with mobility impairments.[20] The PFP CPG further provides matched intervention strategies for patients in each classification. In 2003, it was proposed that individuals with patellofemoral pain be categorized based on examination findings;[22] a similar goal is desired from this manuscript for patients with subacromial pain.

CLASSIFICATION OF SUBACROMIAL PAIN

Based on the ICF-based classifications suggested for PFP,[20] the authors of this article are proposing a parallel application of the classification system based on clinical findings related to SAPS into the following categories: SAP with overuse/overload, SAP with movement coordination deficits, SAP with muscle performance deficits, and SAP with mobility deficits. The clinician can then effectively administer matched interventions based on identified impairments. Despite the growing body of CPGs that associate impairment-based classifications to evidence-based interventions, few studies have validated the outcomes of using matched interventions. Fritz and Brennan,[23] using the previous neck pain classification system proposed by Childs et al,[21] determined that interventions matched to classifications were associated with better outcomes than those receiving non-matched interventions.

SAP with Overuse/Overload

Individuals who perform repetitive shoulder motions, experience excessive loads such as Swimmer's Shoulder,[24] or participate in high volume overhead sports and training may find themselves in the overuse/overload classification category. These could be "X" Shoulders, where the "X" is the activity that seems responsible for the recurrent shoulder pain. Clinical findings that would be most helpful in classifying these patients would primarily be found in the subjective examination. Decisive subjective elements may include but are not limited to: (1) aggravating factors, (2) easing factors, (3) pain level with functional activity, and (4) patient-reported recreation- or occupation-related activities that are associated with their pain. Additional causative factors such as (1) overuse, (2) misuse, (3) new use, and/or (4) abuse should also be considered.

SAP with Movement Coordination Deficits

The classification of SAP with movement coordination deficits includes all motor control-related impairments. Clinical findings may include static observation of scapular position identifying Kibler Type I-III dyskinesis.[25] However more importantly, observing dynamic scapular dyskinesis during arm elevation and behind-the-back activities. Abnormal scapular kinematics may become apparent during functional arm movements, against resistance, or under load. Assessment of scapular dyskinesia may be of greater utility than performing special tests that attempt to diagnose a pathoanatomical source; however, a recent systematic review questions the validity of clinical measures to assess scapular dyskinesis.[6,26-29,57]

Adequate scapular upward rotation and posterior tilt are required during arm elevation;[30] reductions in either motion could potentially reduce the available subacromial space and subsequently contribute to the development or perpetuation of impingement.[31] The lower fibers of serratus anterior and lower trapezius in conjunction with the upper trapezius muscles create an important force couple to produce scapular upward rotation, creating optimal positioning of the glenoid surface during arm elevation.[32] Decreased serratus activation may contribute to lesser upward rotation and posterior tilt observed in subjects with shoulder dysfunction while excessive or premature activation of the upper trapezius is responsible for greater clavicular elevation.[33] Increased upper trapezius activation has also been associated with a reduction in serratus anterior, middle, and lower trapezius muscle activation.[34,35]

SAP with Muscle Performance Deficits

The classification of SAP with muscle performance deficits includes all glenohumeral and scapulothoracic strength impairments. Physical examination findings use strength assessments. Manual resistance or handheld dynamometers can be used to measure strength through either a "break" or "make" test.[29] The authors recommend using the "break" test with the patient's arm in 110-125° of elevation to visually observe which force couple (ie, glenohumeral or scapulothoracic) "breaks" first when resistance is applied. This functional manual muscle test has been shown in several studies to adequately assess the strength of all 3 trapezius muscles as well as the lower portion of the serratus anterior muscle.[36,37] Determining the source of weakness would help clinicians to decisively focus strengthening interventions to the appropriate group of muscles: the humeral elevators (eg, deltoid, rotator cuff muscles) or the scapular upward rotators (eg, lower trapezius, upper trapezius, lower fibers of serratus anterior). With that said, it should be noted that weakness of the glenohumeral force couple may be in part due to weakness of the scapulothoracic force couple, aberrant scapular posture, or scapular motor control deficits. Special tests such as the Scapular Flip Test may be a helpful addition to identify strength impairments of scapulothoracic muscles. Poor scapular positioning can result in rotator cuff muscle weakness;[38] excessive protraction was found to reduce rotator cuff muscle strength by 23% while neutral scapular position provides maximal rotator cuff strength.[29,39,40] These findings suggest that even if glenohumeral force couple is observed to "break" first during functional testing, failing to address the scapulothoracic muscles may lead to incomplete intervention strategies and predispose the patient to recurrent pain. Strengthening exercises may begin with reloading isolated muscles, but should ultimately be progressed to strengthen compound movement patterns that are often required for recreational activity and sports performance.

SAP with Mobility Deficits

This classification of SAP with mobility deficits includes all glenohumeral and scapulothoracic mobility impairments (eg, muscle extensibility and joint mobility dysfunctions). Mobility impairments can adversely affect posture, reduce subacromial space, and cause aberrant movement patterns. Passive range of motion testing, joint play assessment, muscle length testing, and postural observations should be considered.[33,41] Tightness of the posteroinferior capsule and posterior rotator cuff muscles have been proposed to cause an anterosuperior humeral translation toward the coracoid process and increased scapular anterior tilt.[12,14,33,42,43] Impaired soft tissue extensibility of the pectoralis minor and thoracic kyphosis has also been correlated with increased scapular internal rotation and anterior tilt.[33] As a result of excessive activation or passive tension of the pectoralis minor muscle, normal scapular motions of upward rotation, posterior tilt, and external rotation during arm elevation may be restrained.[41] Muscle length assessment of the humeral

internal rotators should also be performed due to their direct potential to limit glenohumeral external rotation during arm elevation. To achieve full arm elevation, 60° of glenohumeral external rotation is required to avoid subacromial space reduction.[33]

There is a subpopulation of individuals with shoulder pain due to hypermobility. Multidirectional instability, though less common, frequently manifests impingement-like symptoms. If instability and subacromial pain are concurrently present, shoulder instability should be considered the primary etiology and addressed first.[44] For these reasons, the authors have included assessments for glenohumeral hypermobility as part of our physical examination for SAP with mobility deficits in **Table 1**, but no interventions have been suggested in **Table 2**. If hypermobility is identified, patients can be categorized under the broader ICF classification of shoulder stability and movement coordination impairments (**Table 3**). The rule-in criteria for this classification have been modified and adapted from Kelley et al.[44]

To identify total body mobility impairments that might be contributors to SAP, there is a need for a reliable, standardized movement screen. The Selective Functional Movement Assessment (SFMA) may help fill this void. The SFMA is a comprehensive, full-body functional movement assessment tool consisting of 10 body movements used to help identify movement dysfunctions and asymmetries in the clinical pain population.[45-47] Studies have validated the SFMA model with self-report functional outcomes measures of the spine and extremities.[47,48] At its core, the SFMA is grounded in the concept of regional interdependence, which contends that all parts of the body are linked through the musculoskeletal system.[49,50] The SFMA guides physical therapists with identifying dysfunctional movements that are often missed by conventional examination procedures.[49]

Intervention Prioritization

Once impairments have been identified and appropriately clustered, focused interventions from each classification category can then be administered (**Table 2**). The authors recommend using Gray Cook's "The Three Rs" (Reset, Reinforce, Reload) concept for rehabilitation and performance training.[51] The reset phase is used to address mobility impairments, aligning with the SAP with mobility deficits classification. Interventions used during this phase address joint mobility and tissue extensibility dysfunctions. The primary intent is to improve mobility and/or reduce neuromuscular guarding and tone of the involved soft tissue structures. Depending on the degree of mobility impairments identified, the reset phase may span over multiple sessions or may be resolved in a single treatment. Addressing mobility dysfunctions during the reset phase typically precedes the active reload phase. To determine if adequate mobility has been restored to effectively progress the patient into the next phase, reassessment is necessary through a physical examination or movement screen.

Though mobility interventions typically precede motor control and strength, patients do not move in a linear, stepwise fashion through each impairment classification. Since many patients with SAP will likely have examination findings that correspond to multiple categories, prioritization of interventions is recommended. The authors recommend prioritizing the treatment strategies for SAP with overuse/overload and SAP with mobility deficits classifications. If a client is repetitively overloading their shoulder, high tissue reactivity and irritability are more likely to be present and will delay progress. Similarly, if the client has limited mobility, it is less likely that they will be able to perform pain-free overhead strengthening and motor control exercises. Therefore, first, implement interventions to address mobility deficits or provide patient education on protective strategies and activity avoidance to build a foundation for success with subsequent treatments.

Subacromial Pain Syndrome

TABLE 1 Decision Tree Model: Subacromial Pain (SAP) Classifications

SAP with Overuse / Overload	SAP with Movement Coordination Deficits	SAP with Muscle Performance Deficits	SAP with Mobility Deficits
"X" Shoulder	Motor Control Impairments	Strength Impairments	Mobility Impairments

Subjective Examination
• Repetitive, "abusive" shoulder activities and sports
  • Overuse / overload
  • Misuse
  • New use
  • Abuse
• Aggravating factors
• Easing factors
• Numeric pain rating scale with functional activities
• Sport-, hobby-, or occupation-related activities associated with pain
	Physical Examination
	• Static observation
	  • Kibler Type I-III
	• Dynamic observation
	  • Arm elevation: scapular dyskinesis
	  • Hand behind back: winging with normal passive IR
	• Special testing
	  • Scapular dyskinesis test
	  • Without load
	  • With load
	  • Scapular reposition / retraction tests
	  • Scapular assistance tests
	• Movement analysis (SFMA)
		Physical Examination
		• Functional strength testing
		  • Scapular flip test
		  • Quadruped scapular stability test
		  • Shoulder flexion and abduction to 120°
		  • Scapulothoracic force couple
		  • Glenohumeral force couple
		• Specific strength testing
		  • Serratus anterior
		  • Lower trapezius
		  • Supraspinatus
		  • Teres minor
		  • Infraspinatus
			Physical Examination
			• Hypermobility
			  • Joint play: grade 4-6
			  • Special testing[a]
			• Hypomobility
			  • Static observation
			  • Scapula
			  • Anterior tilt
			  • Downward rotation
			  • Elevation / depression
			  • Humeral IR
			  • Thoracic kyphosis
			  • Palpation
			  • Anterosuperior humeral head position
			  • AROM / PROM
			  • Joint play: grade 0-2
			  • Posteroinferior glide
			  • Muscle length
			  • Pec major / minor
			  • Infraspinatus / teres minor
			  • Scapular elevators
			  • Subscapularis
			  • Latissimus dorsi / rhomboids
			  • Special testing
			  • GIRD test
			• Movement analysis (SFMA)

Special tests for pathoanatomical diagnoses:

- "Impingement": Neer's Test, Hawkins-Kennedy Test, Cross-Arm Adduction Test, Yocum's Test
- Bicipital Tendinopathy: Upper Cut Test, Speed's Test
- Supraspinatus: Full Can Test, Empty Can Test, Drop Arm Test, Lateral Jobe Test, Resisted ER Test
- Subscapularis: Gerber Lift Off Test, Belly Compression Test, Bear Hug Test
- SLAP Lesion: Biceps Load II Test, O'Brien's Test
- [a]Hypermobility / Instability: Crank Tests, Sulcus Test, Posterior Apprehension Test, Load + Shift Test

A recent systematic review focused on physical therapy interventions for SAP strongly recommends exercise therapy as the "first-line" intervention to reduce shoulder pain, improve mobility, and increase function.[17] However, in concurrence with Gray Cook[51] reset principles, the authors also strongly recommend manual therapy (eg, joint mobilization, neurodynamic therapy, mobilization with movement, soft tissue mobilization, and manipulation) administered to the shoulder girdle and spine as an effective adjunct treatment during the early stages of rehabilitation.

"The Five R's"

The authors have modified Cook's framework of "The Three R's" by subdividing Reload into 2 phases: (1) Reload (SAP with muscle performance deficits) and (2) Retrain (SAP with movement coordination deficits) to better align with the division of strength impairments and motor control impairments by the Academy of Orthopaedic Physical Therapy. A fifth "R," re-educate, has also been added. Muscle reloading for those with strength impairments may include reintroducing an exercise that had been placed on hold during the reset phase or the introduction of graded resistance exercises. In patients with motor control impairments, corrective exercises can be initiated to retrain their movement once adequate mobility has been restored. Within the retrain phase, the individual must achieve optimal movement patterns for return to functional activities and sports performance.

Cook's reinforcement phase includes client education and counseling.[51] This phase is important across all SAP classifications, helping to maintain improvements between visits through self-care, protective strategies, and lifestyle management. A publication in *The Lancet* from 2018 strongly advocated for radical changes in health care strategies for the management and prevention of long-term disability.[52,53] As an overarching strategy, they propose a "positive health" concept which they define as "the ability to adapt and to self-manage, in the face of social, physical, and emotional challenges."[52,53] This provides patients with the proper education to reframe unrealistic expectations to lead to lower disability and higher quality of life. Adjusting our patients' counterproductive attitudes about pain may have far-reaching effects, empowering them with the resources to self-manage their condition through appropriate coping strategies such as physical activity rather than repeatedly seeking unnecessary medicalization.[54] Protective measures and lifestyle changes including behavioral adaptations and sleep posture alterations.

To provide further continuity and correspondence between the proposed SAPS classification system and Cook's concepts, the authors recommend that an additional "R", re-educate, be ascribed as the primary intervention strategy for those classified in SAP with overuse/overload. These recommendations are not intended, in any way, to undermine "The Three R's" as initially described by Gray Cook.[51]

TABLE 2 The 5 R's of Rehabilitation: Subacromial Pain Classification-Based Intervention Strategies

SAP with Overuse / Overload	SAP with Movement Coordination Deficits	SAP with Muscle Performance Deficits	SAP with Mobility Deficits
Re-educate	**Retrain**	**Reload**	**Reset**

Counseling
• Protective strategies and activity avoidance
  • Limit or avoid provoking activities
• Aberrant activity modification
  • Adjust:
  • Load
  • Repetitions
  • Volume
  • Intensity
• Relative rest
  • Active rest or other modifications to maintain fitness level
	Motor Learning
	• Corrective exercises
	• Feedback delivery
	  • Frequency
	  • Bandwidth
	  • Verbal
	  • Tactile
	  • Visual
	• Conscious muscle control[14]
	  • Coordination
	  • Timing
	• Advanced control during basic activities[14]
	• Advanced control during sports-specific movements[14]
		Strength & Stability
		• Postural control
		• Isolated muscles
		  • Serratus anterior, inferior fibers
		  • Lower trapezius
		• Scapular progression
		  • Blackwell prone scapular exercises
		• Compound movement patterns
		  • Strengthen component motions
		  • Strengthen entire movement
		• Balance-ratio[19]
		• Endurance[19]
			Mobility
			• Joint mobilization
			  • Glenohumeral
			  • Scapulothoracic
			  • Acromioclavicular
			  • Thoracic spine
			• Mobilization with movement
			  • Glides with arm elevation
			• Passive ROM
			  • Glenohumeral IR
			• Stretching / STM
			  • Pec major / minor
			  • Infraspinatus
			  • Teres major / minor
			  • Subscapularis
			  • Latissimus dorsi / rhomboids

Re-educate to reduce load and use	Retrain to correct movement	Reload for muscle performance	Reset through manual therapy

Reassess to determine patient readiness to move into the next prioritized classification category:
- Example: After the reset (manual therapy, stretching), re-assess to determine if the client has adequate mobility to initiate motor control and stability training. "Mobility precedes motor control and stability."

Reinforce
- Continual psychosocial education for appropriate pain-management strategies and self-management of activities
- Used to maintain reset gains provided by the practitioner
- Reinforcement dependent on classification (impairments):
  - Overuse/Overload ("X" shoulder): behavioral modification, ergonomics, sleep posture, etc.
  - Movement Coordination Deficits (motor control impairments): kinesiotaping to provide neurophysiological input
  - Muscle Performance Deficits (strength impairments): home strengthening program
  - Mobility Deficits (mobility impairments): home stretching program

CONCLUSION

Syndromes are complicated pain conditions that are often multifactorial. To best classify a patient into the appropriate classification(s), a thorough subjective and physical examination is necessary. Using the theoretical framework found in **Table 1**, the examiner is provided with an organizational outline to prioritize the high volume of clinical findings to assist in proper categorization. This impairment-based diagnostic classification allows clinicians to effectively confront identified impairments with matched interventions provided in **Table 2**. The ultimate goal of an impairment-based classification schema paired with matched intervention strategies is to maximize clinical outcomes in individuals with non-specific, complex pain conditions such as SAPS.[21]

The authors strongly encourage the Academy of Orthopaedic Physical Therapy of the APTA to develop an evidence-based CPG for SAPS using similar published models as done previously with Staged Approach for Rehabilitation Classification for the shoulder,[16] PFP CPG,[20] and the Neck Pain CPG.[18] The authors hope that this article may serve as

Shoulder Pain with Stability and Movement Coordination Impairments[28]

TABLE 3 Subacromial Pain Syndrome and Glenohumeral Instability Overlap

Subacromial Pain Syndrome

TABLE 1 Decision Tree Model: SAP Classifications

SAP with Mobility Deficits

Mobility Impairments

Physical Examination
- Hypermobility
  - Joint play: grade 4-6
  - Special testing

Shoulder Stability and Movement Coordination Impairments / Dislocation of Shoulder Joint, or Sprain and Strain of Shoulder Joint[28]

Rule in if:
- Patient's age is less than 40 years
- History of shoulder dislocation
- Presence of multidirectional instability
- Apprehension at end ranges of flexion, horizontal abduction, and/or external rotation

Rule out if:
- No history of dislocation
- Presence of global glenohumeral motion limitations
- No apprehension with end-range shoulder active or passive motions

Interventions

Re-educate	Retrain	Reload	Reset

• Protective strategies and activity avoidance
  • Limit or avoid provoking activities
	• Corrective exercises
	• Advanced control during activities of daily living
	• Advanced control during sports-specific activities
		• Stabilization exercises
		• Strengthening exercises
			• Manual therapy initially to adjacent joints or body regions:
			  • STM
			  • Stretching
			  • Joint mobilization
			  • Scapulothoracic
			  • Joint manipulation
			  • Thoracic spine

Reinforce
- Bracing, strapping, taping
- Psychosocial counseling
- Behavior modification activities
- Home exercise program

a theoretical framework to help launch this important task.

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MECHANISMS OF MANUAL THERAPY INTERVENTIONS

Independent Study Course 31.3

Description

This course will provide the clinician with a needed update on the mechanisms of joint-, soft tissue-, and nerve-biased manual therapy interventions. In these monographs, the authors explore the complex interactions between biomechanical and neurophysiological mechanisms of manual therapy techniques. The authors also discuss the importance of establishing a patient's baseline neurophysiological status – considering both pro-nociceptive and anti-nociceptive mechanisms – which may alter the effects (ie, success versus lack of success) of manual therapy interventions. The non-specific effects of manual therapy are also discussed, including patient factors, provider factors, and provider-patient relationships. Each monograph ends with examples of clinical applications.

Learning Objectives

Upon completion of this monograph series, the participant will be able to:

1. Differentiate biomechanical versus neurophysiological effects of manual therapy in individuals with musculoskeletal pain.
2. Identify interacting mechanisms through which manual therapy may inhibit pain and design interventions accordingly.
3. Describe how nociplastic pain presentations may alter manual therapy outcomes.
4. Analyze the relationship between dynamic quantitative sensory measures of temporal summation and conditioned pain modulation with neurophysiological mechanisms of wind-up and descending inhibition.
5. Compare and contrast the effects of manual therapy versus other physical therapy interventions on opioidergic and non-opioidergic pain inhibitory mechanisms.
6. Apply decision making to determine dosage of manual therapy in the patient with and without nociplastic pain.
7. Describe considerations for patient improvement after they seek care.

Topics and Authors

The Mechanisms of Manual Therapy
Joel E. Bialosky, PT, PhD, FAAOMPT, OCS
Mark D. Bishop, PT, PhD, FAPTA

Manual Therapy for Chronic Conditions: A Mechanistic Approach to Modern Manual Therapy
Carol A. Courtney, PT, PhD, ATC, FAAOMPT
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ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY

APTA American Physical Therapy Association

The Influence of Centralization and Directional Preference on Spinal Control in People with Nonspecific Neck Pain: A Single Arm Clinical Trial

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ABSTRACT

Background and Purpose: The prevalence of neck pain and its associated physical and economical costs is increasing. Mechanical diagnosis and therapy (MDT) is a classification system that uses the testing of repeated end-range movements to guide treatment. The purpose of this study is to investigate the influence of centralization and directional preference (DP) on deep neck flexor performance in people with nonspecific neck pain. **Methods:** Twenty-five patients with neck pain were recruited and evaluated by an MDT credentialed clinician and classified into DP, DP with centralization, or those with no DP. The patient's deep neck flexor (DNF) performance was then assessed with the DNF test. **Findings:** There was a significant improvement in Numeric Pain Rating Scores from the initial to final visit for the group that demonstrated DP, with an average change of 2.68. Relative to the DNF performance of the groups, there was a significant improvement in DNF test hold times from initial to final session in the DP group with an average change of 4.21 seconds and no significant changes in the no DP group with an average change of .33 seconds. **Clinical Relevance:** Decreases in neck pain may influence DNF performance. Conclusion: Patients who demonstrated DP experienced greater reductions in pain and had more favorable improvements in DNF test performance over time. This study supports that patients who demonstrate DP have immediate improvements in DNF performance.

Key Words: McKenzie, neck pain, stabilization

INTRODUCTION

Neck pain is one of the leading musculoskeletal causes of disability, second only to low back pain.[1] A growing number of individuals with spine pathologies are seeking medical care; however, the overall increase in costs for spine pathologies is largely due to the growing cost per individual.[2] The age-standardized rates of incidence, prevalence, and years lived with neck pain in North America are higher when compared globally.[3] Due to these high rates and increases in medical care for individuals with spinal pathologies, further research is essential to develop an efficacious treatment approach.

Current evidence-based interventions to address musculoskeletal conditions of the neck are summarized in the 2017 revision of the Neck Pain Clinical Practice Guidelines (CPGs).[1] The most recent revision includes 4 categories of neck pain: neck pain with mobility deficits, neck pain with headaches, neck pain with radiating pain, and neck pain with movement coordination impairments. The authors of the CPGs recommend that when evaluating people with neck pain, clinicians should include impairment measures such as craniocervical flexion test and neck flexor muscle endurance tests, which are associated with the category of neck pain with movement coordination impairments.[1] Currently, a classification-based approach to neck pain is not included as a guide to intervention but provides a framework for categorizing patients based on their clinical presentation for determining an appropriate diagnosis and treatment.[4,5] Mechanical diagnosis and therapy (MDT), developed by Robin McKenzie,[6] is a treatment-based classification system used to manage people with musculoskeletal conditions.

The MDT process involves mechanical evaluation of a patient through symptomatic and mechanical response to a series of repeated end-range movements in particular directions. According to McKenzie, clinicians then classify the patient into one of 4 categories: derangement, dysfunction, postural, or other-non-mechanical. Centralization refers to a phenomenon where symptoms that originate in the spine are experienced in a distal location, such as a distal extremity, and are abolished and remain abolished in response to specific movements. A patient who demonstrated centralization, reduction of symptoms, and/or an improvement in range of motion (ROM) as a result of repeated end-range movements or sustained postures is classified as having a derangement, and the specific reductive movement or sustained posture is identified as the patient's DP. Once a DP is identified, the patient is instructed by the clinician to perform the specific exercise and to avoid movements, activities, and postures that worsen their symptoms.[6] MDT-trained clinicians demonstrated inter-rater reliability when choosing steps in examination and evaluation.[7] Physical therapists demonstrated a 92% agreement in syndrome classification and 88% agreement with subsyndrome classification in the cervical spine.[7]

Directional preference and centralization may lead to more favorable outcomes and decreases in neck pain. An electromyographic evaluation comparing individuals with neck pain and those without neck pain revealed reduced performance of the DNF muscles in the presence of pain.[8] According to the 2017 Neck Pain Clinical Practice Guidelines, an association exists between DNF muscle activation and neuromuscular control of the cervical spine, the assumption being that these muscles provide proximal stabilization of the neck.[1] Authors have reported that the DNF muscles provide stability in preparation of upper extremity movement.[8,9] Clinicians can assess the DNF muscles, in individuals with or without neck pain, through the craniocervical flexion test.[10] Flexion of the upper cervical spine requires activation of the deep cervical flexors; therefore, the superficial cervical flexors cannot be used to perform this movement.8 Clinicians can also assess the DNF muscles through the DNF test. While clinicians are unable to directly measure cer-

vical spine stability with either test, the DNF test allows the clinician to assess the performance of the DNF muscles without the requirement of a cuff. Both the DNF test and the craniocervical flexion test assess the DNF muscles, and both are considered valid and reliable tests,[8-12] this study used the DNF test as it was more easily administered.

Previously, researchers have identified rapid improvements in spinal control, as measured clinically, before and following MDT intervention.[10,13] Apeldoorn et al[13] investigated the influence of MDT centralization and DP classification on improvements in spinal control for individuals presenting with lumbar spine-related pain. The researchers concluded that those demonstrating DP and centralization of lumbar spine-related pain showed immediate improvements in spinal control. Spinal control was described and measured by clinical stability tests before and following MDT intervention.[13] Takasaki et al10 identified similar results in a patient with constant neck and left lower scapular pain. Following MDT evaluation, the patient was classified as having a cervical derangement. By the fourth visit, the patient had significant improvements in DNF strength and was able to return to all previous functions without pain.

Currently, limited research exists on the effects of the MDT classification-based system on cervical spinal control. The purpose of this study is to investigate the influence of centralization and DP on DNF performance in people with nonspecific neck pain. It is hypothesized that if patients demonstrate DP and centralization in response to MDT end-range mechanical assessment, then they will demonstrate rapid improvements in DNF performance.

METHODS

This study was a single group, test-retest design. The Daemen College Human Subject Research Review Committee approved this study.

Subjects

Patients who were referred to physical therapy for the treatment of neck pain were recruited from a Catholic health outpatient orthopedic clinic located in western New York state. Patients were not eligible to participate if they had a history of spinal surgery, cervical instability, and/or vertebral basilar insufficiency; have a serious medical condition such as cancer, spondylolisthesis, rheumatoid arthritis, ankylosing spondylitis, or other related autoimmune diseases; currently pregnant; positive for upper motor neuron signs,=; or experiencing problems with dizziness, tinnitus, swallowing, or bowel and bladder dysfunction.

Demographics

The mean age for the patients in the DP groups was 50.7 years (SD 13.1) and the mean age in the no DP group was 61.8 years (SD 22.0). The ages of patients ranged from 22-88 years old. The DP group consisted of 9 females and 10 males. The no DP group consisted of 5 females and 1 male. The patient demographics are shown in **Table 1**.

MDT Clinicians

Both clinicians who performed the MDT assessments and DNF tests were physical therapists practicing with the Catholic Health System. The MDT system is called into question when the clinicians have limited training;[14] however, the clinicians in the present study had diploma-level MDT training and both had at least 15 years of clinical experience. Authors suggest that individuals trained in MDT demonstrate reliability in classifying people with cervical and lumbar pain.[7,15]

Procedure

Classifying the participants

The clinicians performed a 45- to 60-minute examination consisting of standard subjective history followed by mechanical evaluation. During the MDT mechanical evaluation, the patients were asked to move their head and neck in various directions and use the Numeric Pain Rating Scale (NPRS) to note pain levels and symptom location. If any directions of movement were found to worsen their symptoms, the movement was stopped and not considered for treatment. After repeated end-range movement examination, the physical therapist determined a classification with group assignment for the condition. Patients were categorized into 3 groups: (1) those who demonstrated DP with centralization, (2) those who demonstrated DP without centralization, and (3) those with no DP. The patients who demonstrated a DP (groups 1 and 2) were educated on a home exercise consisting of their DP movement determined in the mechanical evaluation. They were asked to perform this exercise for 10 to 20 repetitions, 5 to 6 times/day, and to avoid the movements that worsened their symptoms. If the patient did not demonstrate DP, they were prescribed general active ROM exercises of their neck. These exercises were non-specific ROM exercises that included movement toward flexion, extension, sidebending, and rotation. This group of patients were asked to perform 10 movements in each direction, twice daily.

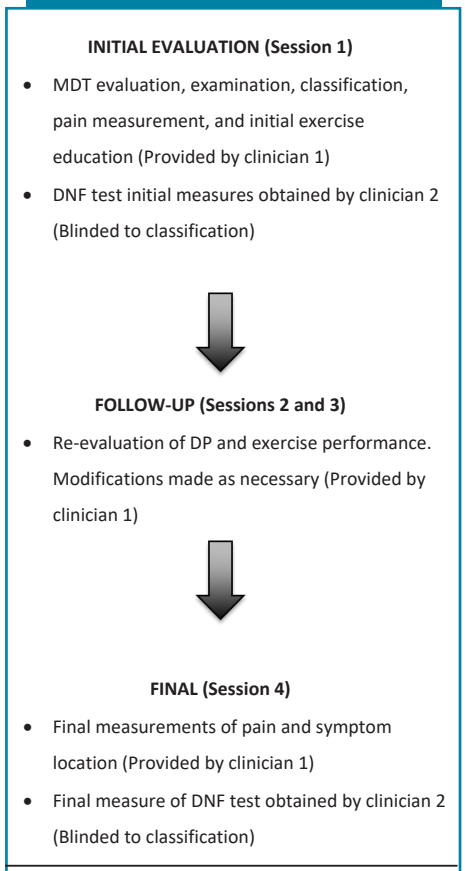
Measuring DNF Performance

During the initial session, the second clinician, who was blinded to the patient's classification, performed the DNF test to provide baseline performance (**Figure 1**). The patient was instructed to tuck their chin, lift their head off the table, and hold that position until fatigue or onset of symptoms. The physical therapist used a stopwatch to assess duration. The test was concluded if the patient demonstrated any of the following: protrusion, shaking, onset or worsening of symptoms, or touching the table with their head.

Table 1. Participant Demographics and Characteristics (n=25) of the Current Study

Group	Directional Preference	No Directional Preference
Age (median)	52	65.5
Age (average)	50.7 (SD 13.1)	61.83 (SD 22.0)
Age (range)	27-72	22-88
Total # in each group	19	6
Female	9	5
Male	10	1
Pain initial (average)	3.9	5
Symmetrical above elbow	2	2
Symmetrical below elbow	0	0
Asymmetrical above elbow	11	3
Asymmetrical below the elbow	6	1
DNF performance (initial)	4.8	3.3

Figure 1. Procedure Flow Chart



Abbreviations: DNF test, deep neck flexor test; DP, directional preference; MDT, mechanical diagnosis and therapy

Follow-up and Final Sessions

The patients attended 3 follow-up 30 minute sessions, spanning a total of 4 weeks with the MDT credentialed clinician who initially examined them (**Figure 1**). At the follow-up sessions, the patients were reassessed to determine if modification or progression of their home exercise was necessary based off their symptom behavior and presentation. At the fourth session, the patient's pain, symptom location, and DNF performance were re-tested by the same clinician who performed the initial test (**Figure 1**).

DATA ANALYSIS

Group demographic averages were calculated by Sage IBM SPSS Statistics v24.0 Student Version (**Table 1**). Descriptive statistics were provided to represent changes in time for the DNF test and changes in pain on the NPRS. The changes in pain and DNF scores over time were compared between groups through ANOVA statistical testing. Spearman's test for correlation was used to identify any correlations between changes in pain and changes in DNF scores. Statistical significance levels were set at $p<0.05$ and a 95% confidence interval was reported. Clinical significance for change in pain was represented by a change greater than 1.3 on the NPRS 0-10.[16]

RESULTS

Between October 2017 and October 2019, 33 patients who presented to physical therapy with non-specific neck pain were recruited and consented to participate and complete the 4 sessions. Eight patients did not have complete data and were not included in the analysis. The DP with centralization group was the most frequent classification with 11 patients followed by DP with no centralization (8 patients), and then no DP group (6 patients). Of the 11 patients in the DP and centralization group, 8 responded to retraction or retraction with extension and 3 responded to side bending. The proportion of males and females were similar (56% female and 44% male). There were differences between the distribution of males and females between the DP and no DP group. The DP group had a similar male and female distribution (47% female and 52% male), while the no DP group had a larger proportion of females (83% female and 16% male).

Pain

Table 2 shows NPRS scores for pre- and post-intervention. The DP without centralization group demonstrated significant differences in mean pain changes compared to the no DP group (p=.004) (**Figure 2**).

DNF Performance

Table 3 shows the mean differences in DNF test times. The DP without centralization group demonstrated significant differences in mean DNF test time changes compared to the no DP group (p=.008) (**Figure 3**).

Correlation

The Spearman's test was used to determine correlation and was chosen because it evaluates the monotonic relationship between 2 continuous or ordinal variables. The Spearman's test indicated a significant correlation (<.05) between changes in DNF test times and changes in NPRS scores over the 4 physical therapy sessions (**Table 4**). Correlation values represent a fair relationship. According to Portney and Watkins, correlations can be interpreted by a general guideline: little or no relationship (.00-.25), fair relationship (.25-.50), moderate to good relationship (.50-.75), or good to excellent relationship (>.75).[17]

DISCUSSION

The purpose of this study was to investigate the influence of centralization and DP on DNF performance in people with nonspecific neck pain. In the present study, the authors found that participants demonstrating signs and symptoms consistent with MDT DP classification exhibited greater improvements on the DNF strength compared to patients without DP. Similar results were observed in studies demonstrating DP in both the cervical and lumbar spine.[10,13] In addition to statistically significant improvements in the DNF strength, patients in the present study demonstrated both statistically and clinically significant reductions in pain, reported on the NPRS, compared to those without a DP.

Previous researchers have yielded percentages of MDT classifications, subgroups, and directions of preference for individuals presenting with spine-related symptoms.[7,18] The derangement classification has been identified as the dominant classification for patients with spinal impairments.[6,7,18] The current study identified that of the 25 patients treated for cervical pain, 19 (76%) patients were classified as having a derangement. Similarly, Hefford et al identified that 77.9% of the 321 patients treated by MDT clinicians for back or neck pain were classified as having a reducible derangement.[18] Furthermore, Claire et al identified 86% (50 patients) with derangement classification in the cervical and lumbar spine.[7] In the present study, 73% of the patients demonstrating DP responded to extension-based exercises while 27% responded to lateral flexion exercises. In previous research, extension-based exercises were the most frequent DP in all 3 areas of the spine. In the cervical spine, 85% of patients demonstrated DP in response to extension-based exercises. Other movements leading to DP were lateral flexion/rotation followed by flexion.[18] As derangement is the most common classification, evidence for this category is clinically useful relative to the viability and consistency of the MDT system and the prognosis of those presenting with cervical symptoms.

Authors have identified average DNF test hold times for healthy adults with reduced performance in those with neck pain.[8,9,11,12] Average DNF test hold times, in the present study, were lower than the average hold times noted in previous research.[9,11,12] One poten-

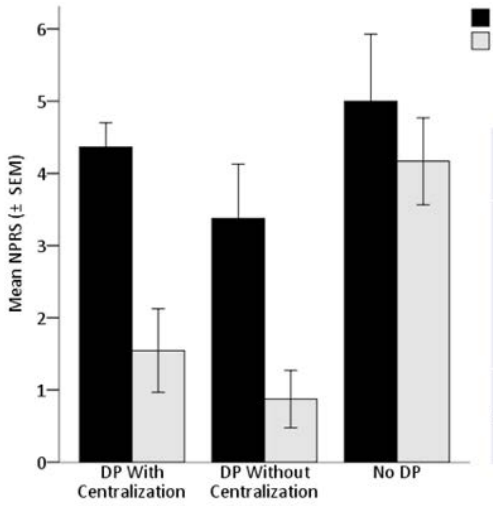
Table 2. NPRS Scores at Initial and Final Sessions

Group	Average Initial Pain	Average Final Pain	Average Difference	Significance
DP	3.95	1.26	2.68	p <.001*
No DP	5	4.17	0.83	p = .258

* statistical significance (p< .05)

Abbreviations: NPRS, Numeric Pain Rating Scale; DP, directional preference

Figure 2. Mean NPRS Scored on 0-10 scale for Initial and Fourth Visit for Each of the 3 Groups



Group	Group	Mean Difference	Std. Error
No DP	DP With CEN	1.63*	0.71
	DP Without CEN	2.46*	0.76
DP With CEN	DP Without CEN	0.83	0.65

*statistical significance (p<.05)

Abbreviations: CEN, centralization, DP, directional preference

Table 3. Mean Difference in DNF Test Times at Initial and Final Sessions

Group	Average Initial DNF (s)	Average Final DNF (s)	Average Difference	Significance
DP	4.79	9	4.21	p <.001*
No DP	3.33	3.67	0.33	p = .18

* statistical significance (p< .05)

Abbreviations: NPRS, Numeric Pain Rating Scale; DP, directional preference

tial explanation for the decreased DNF test hold times in the present study was the termination criteria for the test. Previous studies did not include increases or production of pain for stopping the test. Previous authors allowed participants to drop their head if it was for less than one second. In addition to pain, the variability of DNF test hold times between sexes is statistically significant with higher second hold times in men in comparison to women.[9,12] In the current study the no DP group contained a higher percentage of females and had lower initial DNF performance times; therefore, changes in DNF hold times were depicted by comparing average changes from initial to final visit for each of the group. In regards to age and activity level, researchers have found no statistically significant differences in outcomes on the DNFT.[9]

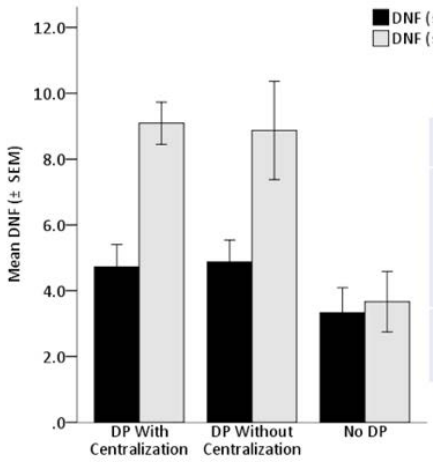
This study demonstrated an indirect relationship between the severity of the patients' neck pain and their performance on the DNF test. Falla et al[8] concluded a similar correlation by comparing patients with chronic neck pain with a control group. Rose et al[19] identified significant improvements in pain for individuals demonstrating DP and centralization compared to those that did not demonstrate centralization. Mechanical diagnosis and therapy has demonstrated success in reducing pain, especially for patients who exhibit a DP,[10,13,15,19] and therefore may be efficacious in DNF performance. Biomechanically, cervical retraction requires maximal flexion of the upper cervical spine, which may lead to improved activation of the DNF muscles;[10] however, the prescribed exercises would have limited influence on the individual DNF test hold times. The parameters of the exercises prescribed in all groups would not have a significant effect on the strength of the DNFs because the exercises do not incorporate the resistance of added weights, are performed against gravity nor were they completed overtime needed for muscle strengthening. Therefore, the possibility that patients demonstrate increased strength of their DNFs due to the prescribed exercises is unlikely.

There were several limitations that should be considered. Despite demonstrating similar distribution of MDT classifications, the sample size was small, and all the participants were individuals referred to a physical therapy clinic representing one geographical region. Only one treatment approach was investigated for this study, and long-term follow-up measures were not included. Additionally, to the researchers' knowledge, there are no tests to directly measure cervical spine stability. Future research should investigate a larger sample, long term follow-up, and a variety of treatment groups. Despite these limitations, the results of this study support the need for further research in regards to MDT and cervical spine stability.

CONCLUSION

Patients with neck pain that were classified as having a DP and performed their reductive exercise, demonstrated significant reductions in pain when compared to the patients without DP performing general neck exercises. The patients who demonstrated DP also improved DNF test hold times after 4 weeks compared to the patients who did not demonstrate DP. The authors of this study suggest that patients who demonstrate DP and perform exercises according to their DP demonstrate significantly reduced pain and improvements in DNF muscle performance.

Figure 3. Mean DNF Scored Seconds for Initial and Fourth Visit for Each of the 3 Groups



Group	Group	Mean Difference	Std. Error
DP With CEN	DP Without CEN	0.03	0.99
	No DP	3.41*	1.08
DP Without CEN	Non DP	3.38*	1.15

*statistical significance (p<.05)

Abbreviations: CEN, centralization, DP, directional preference

Table 4. Correlation Between DNFT Hold Times and NPRS Scores

			Difference in Pain
		Correlation Coefficient	-.397*
Spearman's rho	Difference in DNF	Significant (2-tailed)	0.049
		N	25

Abbreviations: DNF, deep neck flexor, DNFT, deep neck flexor test, NPRS, Numeric Pain Rating Scale

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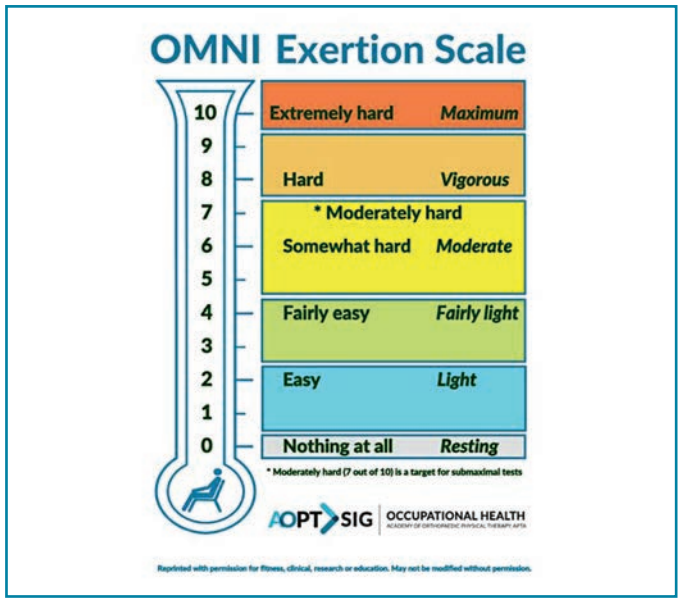
PRESIDENT'S MESSAGE

Rick Wickstrom, PT, DPT, CPE, CME

CSM is just around the corner. To learn more about best practice in the next frontier of Occupational Health, be sure to attend OHSIG's featured session OR-10588 Return to Work- It Does Not Happen by Accident on Thursday, February 3rd from 3-5 p.m. by speakers Lorena Payne, PT, MPA, OCS and Dee Daley, PT, DPT. Lorena and Dee have served the OHSIG as occupational health experts, advocates, and leaders for decades. Join me and other SIG leaders on Thursday, February 3, 2022, from 7:30-9:00 p.m. at the OR-11575 - AOPT OHSIG Meet and Greet Reception. We will hand out OHSIG branded OMNI Exertion Scales and safety vests, to help monitor dance opportunities led by the PASIG, or pub crawls for those of you who still have stamina to burn afterwards. This latest version of the OMNI was created in collaboration with Dr. Robert Robertson who originated the OMNI pictorial scales for rating perceived exertion. It aligns with the Heart Rate Reserve model to support physical activity prescriptions.



The OHSIG is on the move! The New Year marks the release of the first ISC course for our Occupational Health Advanced Practitioner credentialing program is on track for release in 2022, titled Bridging the Gap Between the Workplace and Therapy Clinics. We also have a presentation planned for early January 2022 to our OHSIG State Resources about victory by North Dakota Chapter in getting physical therapists included as Primary Treating Providers in ND Workers' Compensation. The article that follows sets a great tone by our OHSIG Vision statement to *Lead the world in optimizing movement, musculoskeletal health, and work participation from hire to retire.* We need to communicate the value of direct-to-employer services that demonstrate value that physical therapists contribute to Total Worker Health®.

Employers are recovering from the negative impacts of COVID-19. Our new normal provides new opportunities for direct-to-employer services that optimize movement and function from hire to retire. I am confident that you will appreciate the perspectives from Michael J. Kean, CSP and Cory Blickenstaff, PT, MSPT, OCS on how to establish a value proposition with employers on the value of work-site physical therapy. Enjoy!

Perspectives from Occupational Health and Safety Management of the Value of Work-Site Physical Therapy

Michael J. Kean, CSP and Cory Blickenstaff, PT, MSPT, OCS

PREFACE

The purpose of this document is to provide an overview of the history, knowledge, and professional roles of occupational health and safety management and the benefits of Physical Therapists within occupational health and safety management organizations. This document expounds upon "Current Concepts in Occupational Health: Role of Physical Therapists in Occupational Health" as published by the Academy of Orthopedic Physical Therapy.[1] All physical therapists and occupational health and safety professionals may find it beneficial to understand the benefits of using physical therapists within an occupational health and safety management organization. This document will also guide physical therapists in collaborating with occupational health and safety management organizations to drive sustainable improvements in occupational health while enhancing the quality of life of those they serve.

Hyperlinks are provided to underlined text to access information on other websites about key regulations, best practice examples, or explanatory guidance.

INTRODUCTION

Occupational Health and Safety Management (OHSM) may be generally defined as the science of the anticipation, recognition, evaluation, and control of hazards arising in or from the workplace that could impact the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment.[2] Occupational Health and Safety Management is a broad professional field, which spans many disciplines, including safety science, biology, chemistry, psychology, management, engineering, and health and wellness. A modern OHSM organization often consists of occupational safety, process safety, industrial hygiene, emergency response, and occupational health professionals. Today more than ever, OHSM is a corporate and social responsibility, and is a component of most organizations' business philosophy.

The General Duty Clause of the OSH Act of 1970 requires that, in addition to compliance with hazard-specific standards, all employers provide a work environment "free from recognized hazards that are causing or are likely to cause death or serious physical harm.[3]" Compliance with the Occupational Health and Safety Administration (OSHA) regulations are necessary, but insufficient,

and mature OHSM organizations go beyond these minimum requirements. Not all countries have workplace health and safety standards specifically addressing ergonomics and this includes the United States. The National Safety Council (NSC) Injury Facts, a report of all workplace non-fatal and fatal injuries/illnesses within the United States, showed that 31.3% (275,590) of all non-fatal workplace injuries/illnesses were the result of overexertion or bodily reaction.[4]

Present day OHSM organizations include professionals focused on occupational health. Given that human movement is central to worker health and productivity, Physical therapists enable OHSM organizations to anticipate, recognize, evaluate, and control ergonomic hazards. Physical therapists may be internal (ie, employed by the organization) or external (ie, third party/contractor), and their hours of work may vary based on need (eg, 20 hours per week, 40 hours per week, etc). This article will focus on how physical therapists benefit an OHSM organization from the perspective of an experienced OHSM professional.

History of Occupational Health and Safety

The origins of OHSM start with the ancient Babylonians in 2000 BC, with the Code of Hammurabi.[5] The code included specific clauses dealing with injuries, physician's fees, and monetary damages assessed against those who injured others. In later years, the Egyptians and Romans would give pause for concern for human health and well-being as it related to the construction of monuments (ie, Remesseum 1500 BC) and infrastructure (eg, aqueducts, sewage systems, home ventilation, etc). Greek and Roman physicians such as Hippocrates, Pliny the Elder, and Galen documented concerns of metal exposure and its impact on human health. These concerns would be validated during the European Renaissance when Bernardino Ramazzini, an Italian physician published *De morbis artificum diatriba* or *The Diseases of Workers*[6] effectively demonstrating that exposures in the workplace can lead to adverse health effects.

The Industrial Revolution brought about permanent change in how society produced goods. Among these changes were the introduction of inanimate power to replace people and animal power, the substitution of machines for people, the introduction of new methods for converting raw materials, and the organization and specialization of work.[5] These changes introduced new hazards in the workplace creating the potential for serious injuries and fatalities with very little incentive to ensure worker health and well-being.

In the late 1800s and early 1900s several workplace safety accidents occurred throughout the world. In 1907, a mine explosion killed 362 boys and men working in Monongah, West Virginia. In 1911, a fire at a garment factory in New York City, New York killed 146 adults and children. Tragically, more workplace safety accidents would occur, but the public started to demand safe and healthy working conditions. These demands led to such milestones as the Massachusetts law requiring safeguards on hazardous machines (1877), introduction of a federal workers compensation program (1908), the formation of the NSC (1913), and the passing of both the Occupational Safety and Health Act (1970) and the Federal Mine Safety Act (1977).

Providing a safe and healthy workplace is an expectation of all employers today. Most large workplaces have a full time OHSM organization committed to workplace safety and health. In the United States, the Occupational Safety and Health Administration (OSHA) and The Mine Safety and Health Administration (MSHA) enforce safety and health regulations. Other organizations such as the National Institute for Occupational Safety and Health, National Safety Council, Centers for Disease Control, American Society of Safety Professionals (ASSP), National Fire Protection Association, the American National Standards Institute (ANSI), and the International Standardization Organization help advance the OHSM field. Sadly, serious injuries and fatalities still occur, with 5,333 worker fatalities occurring in the United States in 2019.[7]

OHSM Professional Education and Experience

Occupational Health and Safety Management professionals are often college educated, with undergraduate and graduate degrees offered globally. They most often study Safety Science, Occupational Safety Management, Industrial Hygiene or Engineering. The Accreditation Board for Engineering and Technology (ABET) accredits many of the aforementioned undergraduate and graduate programs. In addition, the Board of Certified Safety Professionals (BCSP) review and qualify programs if they meet specific criteria. Occupational Health and Safety Management professionals may obtain professional certifications such as the Certified Safety Professional (CSP)[8] offered by the BCSP and the Certified Industrial Hygienist (CIH)[9] offered by the American Board of Industrial Hygiene (ABIH). Both certifications require experience, education, and a rigorous examination with continuing education requirements.

All ABET and BSCP approved undergraduate and graduate OHSM programs include coursework in Biology, Chemistry, Physics, and Ergonomics and Industrial Hygiene. In addition to coursework, all ABET and BCSP approved undergraduate and graduate programs require experiential learning through internship and/or research participation.[10] The BCSP CSP examination blueprint[11] includes 9 domains. Knowledge domain 1 covers advanced science and math, while knowledge domain 6 covers occupational health and ergonomics. These requirements prepare individuals to lead the OHSM function for organizations, including working cross functionally with physical therapists on Occupational Health.

OHSM Professional Perspective on Occupational Health Applications

Occupational Health and Safety Management programs today apply a management systems approach. Common OHSM system approaches include ANSI/ASSP Z10 – Occupational Health and Safety Management System[12] or the ISO 45001 – Occupational Health and Safety Management System.[13] ANSI/ASSP Z10 Section 8.8 recommends that workplaces establish an occupational health (OH) process(es) to protect the health of workers including the following:

- Anticipation, recognition, evaluation, control and confirmation (that the control is working and effective) for chemical, physical, biological agents and ergonomic and psychosocial stressors that can adversely affect the health of workers;
- Prevention, early detection, diagnosis and treatment of work-related injuries and illnesses, including emergency care;
- Recognition and reasonable accommodation for both work-related and non-work-related medical conditions that may affect workers' abilities to perform their jobs safely and productively;

AND

- Integration with other aspects of the occupational health and safety management system to ensure occupational health risk issues are addressed.

Physical therapists with the knowledge base, training, and skills in occupational health are positioned to play vital roles in each of these processes.[1]

Knowledge required of a physical therapist for occupational health services

- Critical inquiry and evidence-based practice
- Functional implications of health conditions
- Job analysis and ergonomics
- Social Industrial and Commercial Systems
- Science of Population Health
- Occupational Health and Safety Regulations
- Business Management of Occupational Health Services

The areas of practice for physical therapists in occupational health also align with these processes:[1]

- Workforce health promotion
- Workplace ergonomic program consultation
- Functional Job Analysis and Functional Employment Exams
- Entry point care for workers with job participation barriers
- Rehabilitation programs for workers with complex health behaviors
- Functional Capacity Evaluation and Impairment Ratings

A core outcome for a successful OHSM program is the well-being of people. As part of an OHSM program, physical therapists help meet this outcome through the following applications:

- Workforce health promotion
- Prevention, evaluation, and management of work related and non-work-related injuries and illnesses
- Ensure organizations design, operate, and maintain equipment and processes with ergonomics in mind
- Reduction in musculoskeletal disorders caused by the work environment
- Structured, disciplined, and agile injury case management process that is mutually beneficial to all parties

Occupational Health and Safety Management organizations measure their performance against these desired outcomes using clearly defined metrics. Metrics alone are not effective. To be effective, metrics must align to a vision, be measurable, and be reviewed on a regular cadence with key stakeholders. Metrics provide a snapshot of an OHSM organization's effectiveness.

Metrics must align with an OHSM organizations vision. A vision defines what you aspire to achieve and how you plan to achieve it. OHSM organizations must have strategies that support its vision. For example, an OHSM organization may aspire to create a workplace that preserves the quality of life of all employees. This will require the organization to design, operate, and maintain equipment and processes with ergonomics in mind. This example provides both the "what" and the "how" of a vision.

OHSM Perspective of Physical Therapist Offerings in an Occupational Health Setting

Employee Engagement

OHSM Perspective - Occupational Health and Safety Management is a people centered function, so it is important to let people know you genuinely care about them before they require your services. Physical therapists have the unique ability to engage with the workforce in multiple settings in order to build trust and credibility. Physical therapists should take advantage of opportunities to engage workers where they perform their jobs (eg, office, production floor etc). The most successful physical therapists are those who immerse themselves in the organization and find opportunities to engage with all employees through general conversation, training, and hazard identification and risk assessment efforts.

Desired Outcomes - The aforementioned opportunities to engage with the workforce are proactive in nature. They take place prior to an event having occurred and enable physical therapists to establish credibility and trust with the workforce before their services are required. Lastly, they allow the physical therapist to create value for the organization using their knowledge and skills to improve workplace health and safety. Simply put, the desired outcome is to establish a relationship of mutual trust and respect with your customers before they need your services, so that when they do, they feel comfortable doing so.

Measurement of Desired Outcomes – Measuring employee engagement is critical to demonstrating the value of the physical therapist service to the workplace. It truly demonstrates how much the employees value the physical therapist occupational health services. The following are examples of effective employee engagement:

- Total number of employee interactions by Month and Year-to-Date (YTD)
- Total number of employee interactions by Department YTD
- Total number of employee interactions by Type YTD (eg, conversation, training, etc)

Health Promotion and Education

OHSM Perspective – Physical therapists may offer health promotion services[14] related to employer based programs, injury prevention, ergonomic solutions, wellness initiatives, work accommodations, and chronic disease management. While it is preferred that physical therapists offer these services with a regular on-site presence, providing services off site in person or virtually are both realistic alternatives today. The effectiveness of health promotion services is dependent upon the physical therapist and patient relationship, and the physical therapist's knowledge of the work environment. The more the physical therapist is located on-site, integrated into the OHSM organization, and understands the work environment, the more likely the health promotion services will have the desired positive outcomes.

Desired Outcomes – The desired outcomes associated with physical therapy health promotion services are mutually beneficial to employees and employers. Occupational Health and Safety Management professionals desire to collaborate with physical therapists to proactively anticipate, recognize, evaluate, and control workplace musculoskeletal (MSK) disorder risk factors, provide occupational health education to all levels of the organization, and support individual health needs through effective case management. These efforts result in an engaged and knowledgeable workforce, low workers' compensation costs, quantifiable musculoskeletal disorder risk reduction efforts, and employee satisfaction.

Measurement of Desired Outcomes – There are numerous methods of measuring physical therapy health promotion and education efforts. The following are examples of effective health promotion and education measures:

- Workers' compensation costs YTD and 3-year trend
- Total number of proactive educational occupational health activities YTD (eg, health and wellness newsletters, preventative health screens, health fair, training etc)

Functional Job Analysis and Functional Employment Exams

OHSM Perspective – Functional Job Analysis (FJAs) and Functional Employment Exams (FEEs) are critical to understanding the physical demands of specific work activities, proactively identifying and controlling MSK risk factors, and ensuring good injury case management. Physical therapists should collaborate with employees and supervisors to develop initial FJAs and complete reviews on a regular cadence thereafter. Functional Job Analyses provide the necessary data on physical demands allowing the development of functional exams for pre-employment screening, post offer employment testing, and post-injury applications such as post-employment fitness-for-duty/return to work and periodic testing. It is important for physical therapists and OHSM professionals to understand the regulatory and legal issues that must be navigated with FEEs at each phase of employment; pre-employment, post-offer, and post-employment.[15] Occupational Health and Safety Management professionals should collaborate with physical therapists to understand potential job tasks with MSK risks and implement sustainable controls to reduce the risk to an acceptable level. Occupational Health and Safety Management professionals should collaborate with physical therapists and Occupational Health Nurses to ensure Licensed Health Care Professionals have this information so they understand the existing physical job demands prior to determining potential work restrictions.

Desired Outcomes – The desired outcomes associated with FJAs and FEEs are mutually beneficial to employees and employers. OHSM professionals desire to collaborate with physical therapists to develop, document, and sustain the physical job demands for each job task. Occupational Health and Safety Management professionals and physical therapists use this information to proactively understand job tasks at risk for MSK disorders and ensure the development and prioritization of risk reduction strategies. Occupational Health and Safety Management professionals and physical therapists use this information during injury case management, ensuring individuals may safely return to work based on the job's physical demands and potential assigned work restrictions with consideration for potential workplace accommodations.

Measurement of Desired Outcomes – Numerous methods exist for measuring physical therapy efforts toward FJAs and FEEs. The measures for FEEs are consistent with those needed for occupational injury management that will be listed in that section below. The following are examples of effective FJA measures:

- Percent FJAs complete vs. total job tasks
- FJA review percent completed
- Total number of ergonomic opportunities identified through FJA completion
- Lost Work Day Case rate

Workplace Ergonomic Program Consultation

OHSM Perspective – An active and sustainable workplace ergonomics program with cross-functional participation is critical to reducing MSK risk factors within the workplace. Physical therapists should always be included in the workplace ergonomics program as a subject matter expert (SME). Physical therapists understand the work environment; the physical job demands, and how best to apply psychological and physiological principles to the design of work processes to eliminate or reduce MSK risk factors. Even if an OSHM organization has an advanced resource model (eg, Safety Professional, Industrial Hygienists, and Ergonomists etc), not including a physical therapist as a SME limits the ability to influence the organization in ergonomics from a medical, biomechanical, and physiological perspective.

Desired Outcomes – Physical therapists have the ability to positively affect workplace ergonomics if allowed. Physical therapists have both leading and lagging indicator data and may help the organization determine where to focus their efforts. Physical therapists have both the operational and technical knowledge to support ergonomic risk assessments; identifying MSK risk factors in the workplace for new and/or existing work processes. Physical therapists have the requisite knowledge to identify ergonomic solutions, perform associated engineering economic analysis, and communicate alternatives to all levels of the organization so those with decision rights may make an informed decision. Lastly, physical therapists may develop and lead ergonomics related training to all levels of the organization to improve ergonomics understanding.

Measurement of Desired Outcomes –Examples of measuring the desired outcomes for physical therapy workplace ergonomic program consultation are numerous. The following are examples of effective measures of workplace ergonomic program consultation:

- Workplace ergonomic committee meetings conducted
- Total number of attendees at ergonomic committee meetings conducted
- Total number of workplace ergonomic hazards identified vs total number corrected
- Percent of total risk reduction for ergonomic hazard identification (eg, FJA changes, ergonomic assessments, equipment design reviews etc)

Hazard Identification and Risk Assessment

OHSM Perspective – The identification of hazards and associated risks is paramount to positively impacting workplace occupational health and safety. Physical therapists must be engaged in the hazard identification and risk assessment process for ergonomics. This includes both proactive (ie, safety design review for new equipment or work process) and reactive (ie, severe sprain/strain work related injury) hazard identification and risk assessment efforts. Physical therapists must be allowed to provide input based on education and professional experience so that the collective group may apply the hierarchy of controls[16] (eg, personal protective equipment, administrative, engineering, substitution, and elimination) to eliminate or reduce risk associated with workplace hazards that could result in a negative outcome if left uncontrolled.

Desired Outcomes – The desired outcomes associated with physical therapist involvement in hazard identification and risk assessment efforts are numerous. Engaging physical therapists in hazard identification and risk assessment efforts proactively may result in ergonomic hazard elimination by applying Prevention-Through-Design concepts. For example, a physical therapist may review building information modeling designs of equipment with a project team prior to construction to identify hazards and design them out.

Engaging physical therapists in hazard identification and risk assessment efforts reactively may result in ergonomic hazard elimination but it is more difficult to enact change. Both proactive and reactive hazard identification and risk assessment efforts allow for

the identification and prioritization of ergonomic risk factors so that the hierarchy of controls may be applied in order to effectively eliminate or reduce risk and build capacity in our work processes for future negative/unwanted outcomes (ie, injury/illness).

Measurement of Desired Outcomes – Measuring the desired outcomes for hazard identification and risk assessment efforts presents with numerous examples and is important to understanding how effective OHSM efforts are. The following are examples of effective measures of hazard identification and risk assessment:

- Total number of hazard identification and risk assessments completed YTD
- Total number of proactive hazard identification and risk assessments completed vs total number of reactive hazard identification and risk assessments completed YTD
- Total number of ergonomic hazards identified YTD
- Total quantifiable risk identified vs. total quantifiable risk reduced YTD
- Total number of higher order controls applied YTD
- Identification of top 5 ergonomic hazards in the workplace (ie, what is it and where is it located?)

Non-Occupational Injury/Illness Evaluation and Rehabilitation

OSHM Perspective – The evaluation and rehabilitation of employees with non-work-related complex health behaviors are important. Not all workplaces use this service, but those that do see additional direct and indirect benefits to their occupational health program. Employees appreciate this service as it demonstrates employers care about them beyond the confines of the work environment. Employers benefit from improved employee morale and a willingness to engage in the OHSM program elements related to the work environment.

Desired Outcomes – The desired outcomes associated with non-occupational injury/illness evaluation and rehabilitation efforts are many. Employers who evaluate and rehab non-occupational injuries/illnesses see increased participation in the occupational health program and reduced likelihood of non-occupational conditions becoming work related.

Measurement of Desired Outcomes – Measuring the desired outcomes associated with non-occupational injury/illness evaluation and rehabilitation is fundamental and necessary to ensure continuous improvement. The following are examples of effective measures of non-occupational injury/illness evaluation and rehabilitation:

- Total number of non-occupational injury/illness visits YTD (HIPAA compliant, generalized usage data)
- Total number of non-occupational injury/illness visits YTD by Department
- Total number of non-occupational injury/illness visits YTD with Improved Outcomes
- Total number of non-occupational injuries/illness Exacerbated by Work Activities YTD

Occupational Injury/Illness Evaluation and Rehabilitation

OSHSM Perspective – The evaluation and rehabilitation of employees with work related complex health behaviors is important. Most workplaces focus their efforts on this single service, but neglect other services that create value. If a workplace directly contributes to an injury/illness in the workplace, the physical therapist may evaluate the employee and help with rehabilitation. A knowledgeable physical therapist ensures the employee receives the care needed to reach maximum medical improvement while helping them return to their job as quickly and as safely as possible. The use of physical therapists across multiple occupational health roles enables occupational injury care to be even more successful. In other words, if this is the only service being used a lot of value will be left on the table.

Desired Outcomes – The desired outcomes associated with occupational injury/illness evaluation and rehabilitation efforts are many. If employees use the occupational injury/illness evaluation and rehabilitation service, it will be out of trust and respect for the other services provided. An effective occupational injury/illness evaluation and rehabilitation service may result in improved workplace morale, improved employee job performance, improved employee health, well-being, and quality of life. Furthermore, these efforts may result in a reduction in lost-time workdays, a reduction in workers compensation costs, a reduction in insurance premiums, and a reduction in MSK risk factors within the workplace. All of these outcomes are mutually beneficial to the employee and the employer.

Measurement of Desired Outcomes – Measuring the desired outcomes for occupational injury/illness evaluation and rehabilitation is fundamental and necessary to ensure continuous improvement. The following are examples of effective measures of occupational injury/illness evaluation and rehabilitation:

- Total number of occupational injury/illness visits YTD (HIPAA compliant, generalized usage data)
- Total number of occupational injury/illness visits YTD by Department
- Total number of successfully impacted Return to Work/Stay at Work cases
- Employee Injury/Illness by Nature YTD
- Employee Injury/Illness by Nature YTD by Department
- Total recordable incident rate YTD and 3-Year trend
- Total lost workday case rate YTD and 3-Year trend
- Total workers compensation cost YTD and 3-Year trend
- Insurance premium costs 3-Year trend

In conclusion, physical therapists have the skills to enhance an OHSM program through the application of the services spelled out above. Traditionally we have measured occupational health on the outcomes of occupational injury care, but a broader application allows for a more proactive and flexible approach to occupational health. This approach aligns with the contemporary view of OHSM, enabling the building of capacity into the workplace while ensuring quality of life of the workforce.

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DID YOU KNOW?

The Occupational Health Special Interest Group (OHSIG) is developing a new educational credential program to position and promote therapy professionals as experts in occupational health.

Occupational Health Advanced Practitioner (OHAP) Credential Program

Introduction: Physical therapist and occupational therapists who successfully complete the entire program will be recognized as an Occupational Health Advanced Practitioner (OHAP) and promoted as an occupational health expert by the Academy of Orthopaedic Physical Therapy (AOPT).

OHAP Program Steps:

Step One: Complete the following two AOPT independent study courses consisting of a comprehensive selection of monographs that address varied aspects of occupational health (available in 2022).

ISC 1: Bridging the Gap Between the Workplace and Therapy Clinic (15 credits)
- o Total Worker Health® Protection and Promotion Programs
- o Functional Job Analysis & Functional Employment Exams
- o Entry Point Care for Workers with Job Participation Barriers

ISC 2: Advanced Therapy Programs in Occupational Health (15 credits)
- o Work Rehabilitation Programs for Complex Health Conditions
- o Elements of Ergonomic Programs for Healthcare and Industry
- o Functional Capacity Evaluation and Impairment Rating

Step Two: Submit the OHAP program application to begin the credentialing phase.

Step Three: Complete webinar course Current Concepts in Occupational Health Capstone (15 credits). This will require submission of a comprehensive project that will be peer-reviewed by the OHAP Committee. Upon successful passing, course participants receive the OHAP credential.

We plan to award 45 CEUs to therapists who complete the program and hope to keep the overall cost less than $1,000. Therapists who qualify for OHAP credential may be included on a list and searched by practice focus on the AOPT website.

PRESIDENT'S MESSAGE

Laurel Daniels Abbruzzese, PT, EdD | labbruzzese@orthopt.org

COMBINED SECTIONS MEETING 2022

The PASIG is thrilled that we will be able to gather in person in San Antonio, TX Feb 1-5, 2022. However, our PASIG Member meeting will not be in person. We will hold our meeting at the end of the month via zoom. We hope that this will enable more members to participate. The PASIG General Meeting zoom link will be sent via email to all PASIG members. For now, mark your calendars: **Sunday, 2/27 at 5:00 p.m**.

Please also mark your calendars in order to find PASIG members at the following CSM events:

- **Tuesday, 2/1:** At the End of Your Rope: Rehab Solutions for Climbers and Aerialists - Convention Center-301
  - Jared Spencer Vagy, PT, DPT
  - Lynnette Ching-Ling Khoo-Summers, PT, DPT
  - Emily Scherb, PT, DPT
- **Wednesday, 2/2**: Musculoskeletal US of Upper Extremity with Special Focus in Sport and Performing Arts | Co-sponsored with Imaging SIG- Convention Center-301
  - Mohini Rawat, DPT, MS, ECS, OCS, RMSK
  - Jon A. Umlauf, PT, DPT, DSc
  - Dirk Hartog, PT, DPT, OCS, CSCS
  - Colin Rigney, PT, DPT
- **Thursday, 2/3: 6:30-7:30 a.m.** AOPT Student Welcome Breakfast - Marriott Rivercenter -Salon G
- **Thursday, 2/3: 7:00-8:30 p.m.** AOPT Special Interest Group Meet & Greet Reception - Grand Hyatt - Texas Salon A
- **Friday, 2/4: 1:00-3:00 p.m.** AOPT Performing Arts Poster Session – Exhibit Hall 2
- **Saturday, 2/5: 8-10 a.m.** Performing Arts Care in a New World: Re-Imagining Our Approaches to Training, Rehabilitation, and Resilience-Building- Stars at Night BR 2&3
  - Brooke Winder, PT, DPT
  - Marisa Hentis, PT, DPT
  - Kristen Schuyten, PT, DPT, MS
  - Tiffany Marulli, PT
- **Saturday, 2/5: 12-1 p.m.** Performing Arts SIG Screening Meeting – Bonus Room-TBA
- **Saturday, 2/5: 1-2 p.m.** Performing Arts Fellowship Program Q&A – Bonus Room-TBA

PASIG PRACTICE PEARLS PODCAST

We are excited to announce that the third installment of PASIG Practice Pearls Podcast series is now available to members on our website! This episode addresses the **Clinical Management and Considerations for Treating Figure Skaters**. This episode is hosted by **Isabella Scangamore, PT, DPT**, and features PASIG Clinicians, **Sarah Plumer-Holzman, PT, DPT** and **Patti Cavaleri, PT, DPT**. Both Drs. Plumer-Holzman and Cavaleri are Board-Certified Clinical Specialists in Orthopaedic Physical Therapy and treat performing artists at the Harkness Center for Dance Injuries, NYU Langone Medical Center. Thank you to Sarah Edery-Altas for overseeing the Podcast project.

SCAN ME

PASIG CITATION BLAST

If you have a particular interest in figure skating, the October blast was dedicated to Figure Skating. Citation blasts are sent directly to PASIG members in our monthly email blasts but are also archived on our website.

PASIG PERFORMING ARTS FELLOWSHIP

The PASIG continues to support performing arts fellowship training as means of advancing one's practice in this sub-specialty area. We will host a Performing Arts Fellowship Q&A at CSM Saturday at 1:00 p.m. All PA Fellowship programs are accepting applicants for 2023. For information about Fellowships, please contact our Chair, Tiffani Marruli at tiffany.marulli@osumc.edu

PASIG SWAG

Be sure to show off your PASIG pride at CSM. All promotional items are available on the web: https://www.orthopt.org/content/special-interest-groups/performing-arts/pasig-promotional-items

PASIG CALL FOR MEDIA!

We are extending our call for media.

The PASIG would like to feature our own members in videos being created for various strategic initiatives. Rather than grabbing royalty-free content from the web, we would like to develop our own inventory featuring our own members.

Our objective:

"Position members as experts in managing movement and functional performance impairments."

Submissions will be evaluated by a panel of members from the PASIG leadership team. We will provide a $50 (photo) or $75 (video) licensing fee for each piece of media selected for use in PASIG projects.

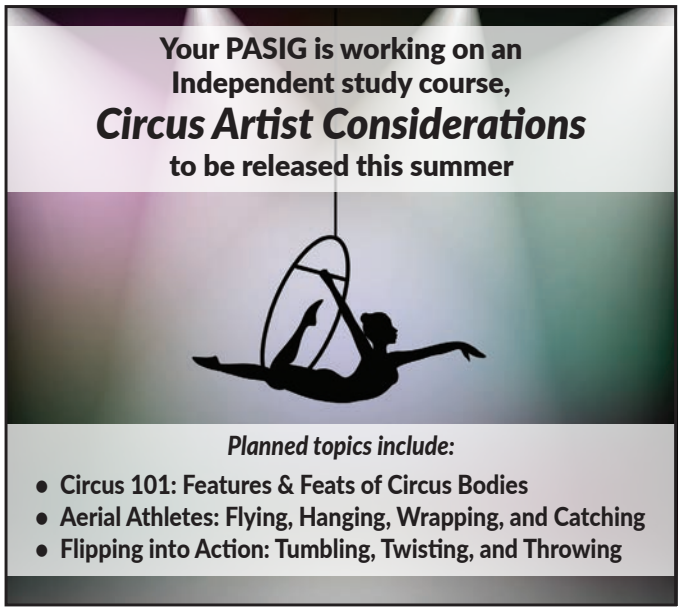
You will be able to submit entries at:
https://cumc.co1.qualtrics.com/jfe/form/SV_6nRQ8IQ5ZKCtDBc

We are seeking original photos and 20-30 second video clips of:
PASIG physical therapists working:

- in diverse settings (research, screening events, backstage, in the clinic)
- with diverse artists (dancers, musicians, skaters, circus artists, etc)
- from diverse backgrounds (old, young, male, female, varied ethnicities, etc)
- We would love to have diversity in both the therapists and patients/clients being featured
- Ideally the photos and videos would showcase unique aspects of performing arts physical therapy
- Physical Therapists are encouraged to wear PASIG apparel

BECOME A PASIG MEMBER

Direct email-blasts go to registered PASIG members. If you would like to receive the monthly citation blast and PASIG news, be sure to become a member.



AOPT SIG | FOOT & ANKLE
ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY, APTA

Hello AOPT Foot and Ankle SIG members! The FASIG, working closely with the education committee for the American Orthopaedic Foot and Ankle Society (AOFAS), gathered in Charlotte, NC in September 2021 for the annual AOFAS meeting. It was a great conference with many great opportunities to attend well delivered talks and engage in professional discussion. We would like to especially thank the following speakers:

- Dr. Stacey Meardon from Eastern Carolina University who gave a talk on joint loading and lateral ankle instability;
- Dr. Ashley Waite from the University of Rochester who spoke about flatfoot rehabilitation;
- Dr. Stephanie Albin from Regis University who gave a talk on ankle arthritis; and
- Dr. Jeff Houck from Upstate Medical University who discussed patient reported outcome measures across the spectrum of foot and ankle diagnoses.

Overall, the meeting and time to connect in-person for this event was rewarding for everyone involved. We now are looking forward to the upcoming Combined Sections Meeting in San Antonio, TX this February 2022.

OTHER IMPORTANT NEWS:

- Analysis of the Practice Analysis Survey data is underway! We anticipate a timely submission to the American Board of Physical Therapy Residency and Fellowship Education (ABPTRFE) by the end of 2021 or early 2022 in time for CSM. Many thanks to the Practice Analysis Coordinators, Project consultant, and the entire task-force working on this.
- The FASIG Practice Committee together with guidance from the AOPT Public Relations Committee has created infographics to share information about common foot and ankle pathologies. These will be shared across the AOPT as a resource for members. Versions may also be developed to inform patients about common conditions and what to expect when seeking treatment. The current infographics are posted to the AOPT_FASIG webpage. We are currently looking for a new Practice Committee Chair. Please reach out to anyone on the FASIG leadership if you are interested.
- Our thanks to Dr. Jay Hertel and Dr. Corbett for the author spotlight on Chronic Ankle Instability. We want to also thank Drs. Hastings, Jeong, and Zellers for their author spotlight on Heel Rise Assessment in Patients with Diabetes. Dr. Abbis Jaffri has done a great job with these author spotlights as the FASIG Research Chair – thanks Abbis for leading this work.
- Make sure to check-out our quarterly newsletters posted to our website (listed below) if you didn't catch them in your email! Dr. Jennifer Zellers at Washington University works closely with a great group of student FASIG members to develop these newsletters. They include summaries of our SIG activity, member spotlights, and a citation blast for hot-off-the press foot and ankle research.

We wish everyone in the AOPT and FASIG well and look forward to connecting with everyone at CSM 2022 in San Antonio.

THE FASIG LEADERSHIP

https://www.orthopt.org/content/special-interest-groups/foot-ankle

PRESIDENT'S MESSAGE

Nancy Robnett Durban, PT, MS, DPT

Hello all…I hope this report finds you well and safe. This publication will highlight your Pain SIG Leaders' reports and preview what is to come at CSM 2022.

Thank You

I would like to start first with a big thank you to Rebecca Vogsland, PT , DPT, for all the work she has done over the past 3 years on the Nominating Committee and for serving as our SIG Nominating Committee Chair this past year. Thank you Becky for your dedication and support of the Pain SIG.

Thank you to all who have submitted and are presenting pain related research and topics at CSM 2022. The Pain SIG leadership hopes you all will attend the AOPT SIG Meet and Greet Reception on Thursday February 3, 2022, at 7:00 p.m. - 8:30 p.m. held in the Grand Hyatt - Texas Salon A. We would love to thank you in person.

Next, I would like to introduce our new SIG Research Committee Chair, Adam Rufa PT, DPT, PhD. He has great plans. Thank you for stepping into this role.

REPORTS

Vice President: Eric Kruger, PT, DPT, PhD, has been helping to promote our SIG sponsored CSM preconference and conference courses (see more below). He is also working on Microlearning for the SIG. Eric will have more exciting announcements at our SIG Membership Meeting.

Nominating Committee: Max Jordon, PT, DPT, PhD, will be stepping into the Chair position following CSM 2022. Presently, the committee is working on developing an internal working timeline document for slating of candidates.

Research Committee Chair: Adam Rufa, PT, DPT, PhD, has hit the ground running getting our first Clinical Pearl out to you. Adam has written the Research Blasts and Clinical Pearl instructions that are posted on our SIG website for easy access. Adam and Eric are collaborating efforts for research educational opportunities in the near future.

Public Relations Committee: Katie McBee, DPT, OCS, has our Pain SIG Facebook page up and running. Search AOPT Pain SIG and ask to join. This is a closed site for our members.

Pain Education Manual: I am excited to report that the Pain Education Manual is finished and has been published. You can find the document at https://www.orthopt.org/uploads/content_files/files/Pain_Manual_Draft_FINAL_6.25.2021%281%29.pdf

Pain Specialization Report: Derrick Sueki, PT, PhD, DPT, GCPT reported that we are in a holding pattern right now. We need agreements from all specialty areas to distribute our survey. Once we get commitments from the two areas we can get final approval from the ABPTS Board.

CSM 2022!

PAIN SIG SPONSORED CSM COURSE: The Pain SIG has the privilege of sponsoring an educational course during CSM programing. This year we are sponsoring:

OR-11096 - Understanding Fear-Avoidance in Patients with Acute, Subacute, and Chronic Pain

Presented by:

Mari Lundberg, Kristin Archer, Ruth Chimenti, David V. Dent, Trevor A. Lentz, and Rob JEM Smeets

Friday, February 4, 2022

11:00 a.m. - 1:00 p.m.

Henry B. Gonzalez Convention Center - Lila Cockrell Theater

Dr. Lundberg has shared her insight regarding the course: "Fear of movement is a central area for us physiotherapists. No matter in what area we work, a great deal of our everyday work consists of supporting people to move despite their fear in different ways. For more than two decades now, we have learned a great deal about fear of movement, what it is and how we can treat it once it has been identified. The challenge for us is to integrate our solid specific physiotherapy competence into the more psychological thinking linked to the treatment of fear."

By this session I would like to explore with you, and some of the world leading researchers in this field how we as physiotherapists can take the lead in developing treatment strategies and even preventive actions for preventing fear of movement to occur. Let's call it fear of movement 2.0.

PAIN SIG CSM 2022 PRECONFERENCE HIGHLIGHT: The Pain SIG would like to highlight the Preconference course being held on Tuesday, February 1, 2022 from 8-5 p.m. Mark Shepherd, PT, DPT; Marie Hoeger Bement, PT, PhD; Carol Ann Courtney, PT, ATC, PhD; Craig Andrew Wassinger, PT, PhD; and Kory J. Zimney, PT, DPT, PhD will present content within the Pain Education Manual.

The course is listed as:

OR-11024 Modern Pain Curriculum for DPT Students: Application of the Pain Education Manual for DPT Educators

8:00 a.m. - 5:00 p.m.

Grand Hyatt - Seguin AB

The following is an excerpt from the manual as to how the manual was developed.

"In June 2018, the APTA's House of Delegates (HOD) passed a motion (RC-43-18) led by Meryl Alappattu, DPT, PhD, and the Florida Physical Therapy Association that charged the APTA to endorse and integrate curricular guidelines for pain education established by the IASP in 2012.[10] As the IASP guidelines were being developed, Fishman and colleagues were developing core competencies for pain education with the creation of an interprofessional committee representing 10 professions.[11] Bement et al followed with the application of these core competencies to PT curricula.[12]

"With the need to review pain education within the entry-level PT curriculum, the Pain Education Committee was organized by the Academy of Orthopaedic Physical Therapy (AOPT) in the fall

2019. The committee was charged to develop and initiate strategies to support and facilitate modern, evidence-based pain instruction in professional entry-level PT programs. The Pain Special Interest Group (SIG) and AOPT, in collaboration with the APTA, the IASP, and the American Council of Academic Physical Therapy, identified individuals to serve on this committee.

"The first committee meeting took place with APTA stakeholders in September 2019. At the meeting, the APTA agreed that the Pain SIG of the AOPT should lead efforts to develop a resource package for academic entry-level programs that provided a broad spectrum of information for faculty on the topic of pain instruction. These resources are intended to assist programs in the development of their pain curriculum that is aligned with modern pain theory and application, the IASP curricular pain guidelines, and the core competencies for the education of pain.[7,10,11] In February 2021, a final draft of this manual was reviewed by stakeholders involved in the development of the IASP guidelines, the physical therapy pain core competencies, and representative PTs from different physical therapy academies."

PAIN RELATED CSM 2022 HIGHLIGHTS: The following CSM educational presentations may be of interest and also recommended.

Thursday, February 3, 2022

OR-10770 Cause of Achilles Tendon Pain? What to Evaluate with Your Next Patient

Ruth Chimenti, Tyler Joseph Cuddeford, PT, PhD, Jennifer Ann Zellers, PT, DPT, PhD, Karin Gravare Silbernagel, PT, ATC, PhD and Jeff R. Houck, PT, PhD

8:00 a.m. - 10:00 a.m.

Henry B. Gonzalez Convention Center - Stars at Night BR 1

OR-11014 The Application of Pain Neuroscience Education: A Step-By-Step Clinical Guide

Adriaan Louw, PT, PhD; Kory J. Zimney, PT, DPT, PhD; Stephen Gerhard Schmidt, PT; and Debra Rico, PT, DPT

11:00 a.m. - 1:00 p.m.

Henry B. Gonzalez Convention Center - Stars at Night BR 2&3

OR-10432 The Impact of Poor Nutrition on Pain Mechanisms and Central Sensitization

Joseph D. Tatta, PT, DPT and Carolyn Byl Dolan, PT, DPT

3:00 p.m. - 5:00 p.m.

Henry B. Gonzalez Convention Center - Stars at Night BR 1

Friday February 4, 2022

OR-11194 The Exercise Prescription Continuum: Evidence-Based Dosing for Pain Modulation, Neuroplastic Adaptation, and Physical Performance

Timothy E. Machan, PT, DPT; Christina D. Gomez, PT, DPT; and Daniel Douglas Larson, PT, DPT, ATC

8:00 a.m. - 10:00 a.m.

Henry B. Gonzalez Convention Center - Stars at Night BR 2&3

OR-10778 Hidden Contributors to Orthopedic Lumbopelvic Pain: Pelvic Health Examination for All PTs

Nick Rainey, PT, DPT; Patricia R. Nelson, PT, ScD; Kelli Jayne Wilson, PT, DPT; and Amy Stone Hammerich, PT, DPT, PhD

11:00 a.m.-1:00 p.m.

Henry B. Gonzalez Convention Center - Hemisfair C1

Saturday, February 5, 2022

OR-10676 Geriatric Low Back Pain: Current and Future Considerations

Ryan Patrick Duncan, PT, DPT, MSci, Corey B. Simon, PT, DPT, PhD and Sean Daniel Rundell, PT, DPT, PhD

8:00 a.m. - 10:00 a.m.

Henry B. Gonzalez Convention Center - Lila Cockrell Theater

OR-10907 Is Modern Physical Therapy Pain Management Socially Equitable, and Does It Need to Change?

Derrick George Sueki, PT, DPT, PhD; Clea P. Tucker, PT; Stephen Anthony Morrison, PT, DPT; and Shemaiah Y. Holness

11:00 a.m. - 1:00 p.m.

Henry B. Gonzalez Convention Center - Stars at Night BR 1

AOPT CSM MUST ATTEND EVENTS:

Thursday February 3, 2022

6:30 a.m. - 7:30 a.m.

OR-11741 AOPT Student Welcome Breakfast

Marriott Rivercenter - Salon G

7:00 p.m. - 8:30 p.m.

OR-11575 AOPT SIG Meet and Greet Reception

Grand Hyatt - Texas Salon A

In closing, the Pain SIG would like to thank President, Joseph M Donnelly, PT, DHSc, FAPTA and our SIG Liaison, Beth Collier, PT, DPT, OCS, FAAOMPT and all of the AOPT office personnel for their continued support and guidance. See you at CSM 2022!

RESEARCH COMMITTEE

At the Education Leadership Conference (ELC) in October 2021, a team from the Imaging SIG Research Committee had a presentation titled, "Expert Clinical Reasoning and Decision-Making that Incorporates Musculoskeletal Ultrasound Imaging in Physical Therapists' Diagnostic Strategies." This was presented by Lorna Hayward, Murray Maitland, Maureen Watkins, Alycia Markowski, George Beneck, and Rob Manske. This presentation is a small representation of a much larger project in which the Research Committee is studying optimal learning methods for physical therapists in acquiring skills with ultrasound imaging.

TITRATED LEARNING

The microlearning modules are finally underway. These are being coordinated by Brian Young, Imaging SIG Vice President and Education Chair. Most of these will be linked to the AOPT Clinical Practice Guidelines as new ones are published with a little backtracking for those most recently published. The intent of these brief educational video modules is to allow practitioners to pursue learning imaging related content in small, manageable doses. At the time of submission for this newsletter, the first had been completed, but had not yet been published.

LEARNING FROM THOSE WHO PIONEERED IMAGING REFERRAL PRIVILEGES

If you did not get a chance to participate in the Imaging SIG webinar live on October 12, please take a few minutes to view the recording and encourage your state leaders to do the same. The webinar was entitled "Experiences of the First Four--Achieving Imaging Referral Privileges." This featured Michelle Collie (RI), Marcus "Kip" Schick (WI), Cindy Flom-Meland (ND), and Lance Dougher (UT). These chapter presidents, present and past, shared their stories of how they achieved imaging referral privileges through the legislative process, including addressing concerns and interests of a variety of stakeholders. The recording of this webinar is available on the Imaging SIG web pages and contains critical information for any state leaders contemplating an initiative toward imaging referral privileges for their jurisdictions.

On a related matter, APTA State Affairs has plans to launch a toolkit for state leaders considering pursuing imaging referral privileges. This toolkit links many resources, including those from the SIG, for those state leaders interested in initiatives for imaging referral privileges by physical therapists.

CSM 2021 IN SAN ANTONIO

The Imaging SIG will sponsor an educational session for CSM 2022 in San Antonio, "Demonstrating Competencies in Physical Therapist Referral for Imaging" and it will be focused on education within physical therapy curricula, but also residencies and education of practitioners otherwise. This educational session will be in conjunction with a revision of our previously published "Imaging Education Manual" (2015). The initial steps for the revision of this manual are now underway with the goal of publishing the manual in 2022.

The SIG is also jointly sponsoring a pre-conference course with the Performing Arts SIG titled, "Musculoskeletal Ultrasonography of Upper Extremity with Special Focus in Sport and Performing Arts." The speakers are Jon Umlauf, Colin Rigney, and Dirk Hartog. This is a one-day course with preparatory work to be done in advance of the "hands on" session on Wednesday, February 2.

The Imaging SIG will not have a member meeting at CSM as the AOPT has determined that difficult timing (a 6:30 AM start time) results in low attendance. Thus, all SIGs under the purview of the AOPT will rely on web-based meetings which also allows for viewing of the recording at members' convenience for the immediate future. There are plans, however, to have another SIG Meet and Greet as occurred in Denver in 2020. Please look for more details from AOPT for the Meet and Greet, if you plan to attend CSM. The next member meeting will be under the direction of the newly elected Imaging SIG President and will occur shortly after CSM.

AIUM WEBINARS

In November 2021, members of the Imaging SIG contributed to a 2-part webinar series by multiple presenters on how ultrasound imaging can enhance physical therapist practice in a variety of practice settings. The first was by Meg Sions and Bruno Steiner on November 1 and the title was "MSKUS in the Hands of the Physical Therapist – Its Current and Expanding Utility." The second installment was similarly titled and was presented by Greg Fritz and Mohini Rawat. The focus of these 2 webinars was to help practitioners understand the value ultrasound imaging can bring to one's clinical care. Recordings of these webinars are available on AIUM's website.

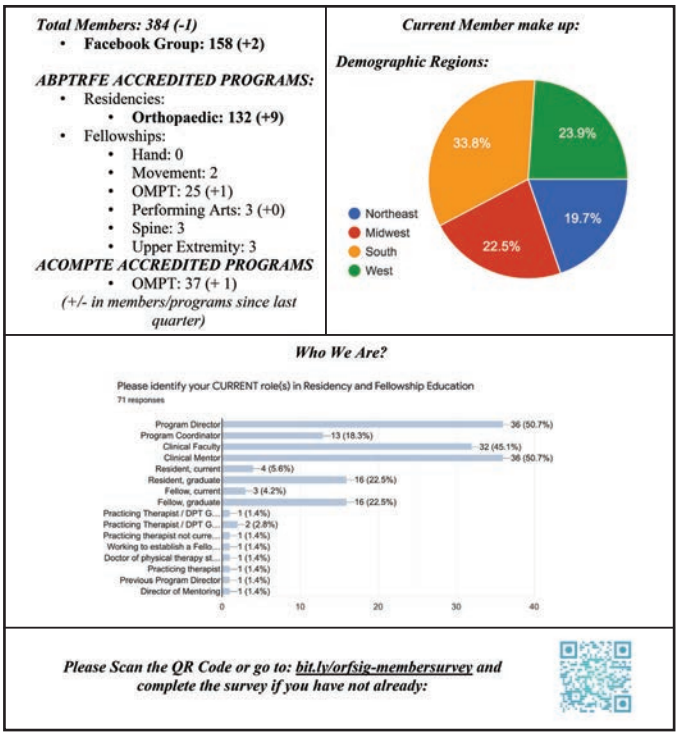
INFOGRAPHICS

The Imaging SIG has created 2 infographics in support of physical therapists having imaging referral privileges. These are now published and are available for download on the Imaging SIG web pages. At the time of submission for this newsletter, work is underway on a third infographic with ultrasound imaging as the focus. These first 2 infographics were derived from the contest we launched in late January and for which we received several submissions. The 2 contest winners were featured in the July issue of *OPTP*.

CLINICAL PRACTICE GUIDELINE INPUT

The Imaging SIG has made progress in establishing a system of input at the start of guideline development and upon review of the draft. This effort is being coordinated by Jim Dauber, who is aligning expert contributors in advance of known CPG activity. As you may recall, this was initiated to assure consistency in imaging content in these guidelines, particularly in the presence of an expanding number of states having imaging referral privileges for physical therapists.

ORF-SIG Dashboard:



UPCOMING COMBINED SECTIONS RESIDENCY AND FELLOWSHIP EVENTS!

Wednesday, January 26th
12:00 p.m. – 1:00 p.m. CST
Annual ORF SIG Business Meeting- Webinar

Wednesday, February 2nd:
8:00 a.m. – 5:00 p.m. CST
Pre-Conference Course: Innovative Strategies in Residency Fellowship Implementation: Creating Adaptability While Maintaining Accreditation in an Evolving Landscape

Thursday, February 3rd:
7:00 p.m. – 8:30 p.m. CST
AOPT All SIG Meet & Greet Reception
Sign up for a raffle to win one free year of the AOPT Residency Curriculum!

8:00 p.m. – 9:30 p.m. CST
ORF-SIG Residency/Fellowship Reception
Residency and Fellowship Programs- Sign up for a reception table to meet and mingle with potential residents and fellows

Attendees who meet with programs will be entered into a raffle to win a copy of the AOPT's
Current Concepts!

PRESIDENT'S MESSAGE

ORF-SIG Members,

By the time most of you will be reading this message, the ORF-SIG will have elected a new President and Nominating Committee Member. While at the time of writing this, the results of this election are still unknown, what we do know, however, is that this will be my final farewell message. With this, I would like to thank you, the members, for a pleasurable and productive past 8 years for the ORF-SIG. More importantly, it is my hope we served your best interests in moving residency and fellowship education forward. While I know that we may have not been able to tackle all the needs at this time, I do know that the ORF-SIG has amazing members to bring new insight and growth for the future. THANK YOU for the new relationships and helping me grow as your leader, it truly has been a humbling and rewarding experience.

Additionally, I would like to thank the leadership and support staff of the Academy of Orthopaedic Physical therapy. Prior to my role as the ORF-SIG President, I had absolutely no experience in such a position. Due to the great mentorship from our Academy President's Steve McDavitt and Joe Donnelly as well the Board Liaisons Pam Duffy, Aimee Klein, and Derrick Sueki alongside other staff and volunteers, I was able to grow professionally in ways I never knew how to previously. I highly encourage individuals interested in being active contributors to the physical therapy profession to reach out to the AOPT to get involved. The support staff here will walk you through different avenues to get involved and grow. Embrace the opportunity!

Alongside my departure will also be the departure of Bob Schroedter from our Nominating Committee. Bob will be exiting as the current chair after serving 3 fruitful years with the ORF-SIG. I cannot send out enough appreciation to Bob and all of his contributions. Since starting with the ORF-SIG, Bob has been instrumental in growing our membership by first better understanding who our members are (that little dashboard at the beginning-that is thank you to Bob ☺). Additionally, Bob helped develop and continue to improve the ORF-SIG website, introduce Microsoft TEAMS for committee work, develop social media content, and most recently unveiled our Monthly Program Spotlight among many other things. All of these activities require extensive background work to develop and grow. Thank you, Bob!

Finally, just as the old saying goes "There is no I in TEAM!" neither is there in the work of the ORF-SIG. I cannot take credit for all the progress the ORF-SIG has made over the past 8 years. None of this would be possible if it were not for our Committee and Subcommittee Members.

1. **Practice / Mentorship Committee**
   - Darren Calley
   - Megan Frazee
   - Vanessa Mirabito
   - Sarah Worth
2. **Research Committee**
   - Kathleen Geist
   - Mary Kate McDonnell

3. **Membership/ Nominating Committee:**
   - Bob Schroedter
   - Tyrees Marcy
   - Molly Malloy
   - Matt Stark
   - Mary Derrick-Manis
4. **Communication Committee:**
   - Kathleen Geist
   - Kris Porter
   - Kirk Bentzen
5. **Liaisons:**
   - APTE RF-SIG: Christina Gomez
   - AAOMPT: Bob Schroedter

Subcommittees & Volunteers

1. **ACAPT Subcommittee**
   - Carrie Schwoerer
   - Kirk Bentzen
2. **ABPTRFE Policy and Procedures Subcommittee**
   - Brooke McIntosh
   - Kathleen Geist
   - Kris Porter
   - Tom Denninger
   - Kirk Bentzen
3. **Curriculum Subcommittee**
   - Molly Malloy
   - Dave Morrisette
   - Linda Dundon
4. **RF-PTCAS/Applicant sharing Subcommittee**
   - Steve Kareha
   - Kirk Bentzen
   - Carrie Schwoerer
5. **Program Spotlight Subcommittee**
   - Bob Schroedter
   - Caitlyn Lang
   - Kristine Neelon
6. **Program / Applicant Demographics Subcommittee**
   - Mike Bourassa
7. **Infographic Subcommittee**
   - Aimee Klein
   - Tyrees Marcy
   - Stephen Kareha
8. **Website Subcommittee**
   - Stephen Kareha
   - Bob Schroedter
9. **Covid Resource Manual Subcommittee**
   - Kirk Bentzen
   - Kathleen Geist
   - Stephen Kareha
   - Molly Malloy
   - Carrie Schwoerer
   - Megan Frazee
10. **ORF-SIG Mentor**
    - Mary Derrick-Manis
11. **Pre-Con Course Presenters**
    - Tara Jo Manal
    - Aimee Klein
    - Erik Robertson
    - Kirk Bentzen
    - Kathleen Geist
    - Stephen Kareha
    - Molly Malloy
    - Tyrees Marcy
12. **CSM/Webinar Presenters**
    - Kirk Bentzen
    - John Childs
    - Tom Denninger
    - Jason Tonely
    - Gail Jensen
    - Matt Lee
    - Elliot Mattingly
    - Carol Jo Tischner
    - Kris Porter
    - Arlene McCarthy

This amazing group of individuals truly have been the driving force behind all that the ORF-SIG has done! I look forward to future development and offerings from the new ORF-SIG leadership!

THANK YOU and Farewell!,

Matt Haberl
President, ORF-SIG

ORF-SIG Committee/Subcommittee Updates

Applicant Registry: Steve Kareha, Matt Haberl, Kirk Bentzen, Carrie Schwoerer

One big problem facing programs over the years is the ability to sustain consistent applicant bases despite using or not using RF-PTCAS. Based on your feedback, we have created two surveys to aid in this effort.

1. The first is to become a contact list library for our member programs of physical therapists and physical therapist students interested in learning more about orthopaedic residency and fellowship programs.
   a. Currently, we have 30 interested people who have signed up to receive more information about our programs.
2. The second is specifically for those qualified applicants who are excellent candidates and have already been vetted but applied to a program that does not have any available spots. The program denying admission may then provide the applicant with a flyer explaining the database and providing them the option to participate. Member programs may access these qualified, vetted applicants as needed by contacting Steve Kareha (stephen.kareha@sluhn.org). Updates on the numbers of candidates in this list will be provided quarterly to the membership.
   a. Currently, everyone who was on this list has been admitted into a program.

Residency & Fellowship Interest

http://bit.ly/2OH6zdX

Residency & Fellowship Qualified Applicants

http://bit.ly/3u0JR0s

Program Spotlight: Caitlyn Lang, Kristine Neelon, Bob Schroedter

We did it! The successful launch of the Program Spotlight took place in October 2021 with 4 programs participating in the inaugural line up. The Selection Committee cannot express enough thanks to all those who were instrumental in its development. It truly has been a team project that will, hopefully, extend well into the future to help programs and prospective candidates find each other and further program sustainability. Details on the program, how to apply and to view the growing list of Spotlighted programs please go here: https://www.orthopt.org/content/special-interest-groups/residency-fellowship/orf-sig-program-spotlight. But we are not done yet. We continue to improve the flow, presentation and usability of the Program Spotlight so look for future rollouts to be even better!

RF-PTCAS: Kirk Bentzen, Steve Kareha, Megan Frazee, Carrie Schwoerer, Christina Gomez

The 2021-2022 Admissions Cycle opened in RFPTCAS in early October. If you have not done so already, take the time to review your set up.

Are you aware of the "Transfer Settings" function within RFPTCAS? This function allows you to copy forward information like scoring set up, letters, groups, local designations, and more. This function can only be done once per year by one individual within your program.

If you are interested in this function, please follow this link for detailed information: https://help.liaisonedu.com/WebAdMIT_Help_Center/Documents_and_Reference_Guides/Transfer_Settings_Guide .

Please contact Carrie Schwoerer (cschwoerer@uwhealth.org) with questions.

OTHER KEY RESOURCES:

ABPTRFE Updates: Community HUB

Don't miss out on the latest ABPTRFE Updates from Kendra Harrington:

- 2021 ACIR and 2022 Annual Fee
- Future of PTA Education Summit
- APTA's Resident Competency Evaluation Instrument
- Virtual Site Visit
- RF-PTCAS Reminders

Take advantage of our member-only communication forums to share and develop ideas.

ORF-SIG Facebook group

bit.ly/orfsig-fbgroup

AOPT ORF-SIG Communities HUB

bit.ly/orsig-communityhub

ACOMPTE WEBSITE AND RESOURCES:

Orthopaedic Manual Physical Therapy Fellowship programs find ACOMPTE Information here:

APTE RF-SIG RESOURCES: CHRISTINA GOMEZ

aptaeducation.org/special-interest-group/RFESIG/

You can also find more great information from the Academy of Education's Residency and Fellowship SIG (RFESIG). Here you will find a variety of Podcasts they have completed for Residency and Program Directors. Please make sure to check these out as well as the Think Tank resources.

Cupping with RockPods™ in Canine Rehabilitation: Case Studies (Part 2 of 2)

Michael Yeo, CMT, CCKTP, CBT, SAAP, VN
Edited by Amie Lamoreaux Hesbach, PT, DPT, MS, CCRP, CCRT

RockPods™ are a cupping therapy device consisting of "rubbery suction bell-shaped pods" made of silicone and designed, manufactured, and marketed by RockTape. RockPods can be used to provide a compressive-decompressive gradient to skin via suction similar to traditional cupping tools, thus increasing local circulation, and can be used in coordination with manual therapies, instrument assisted soft tissue mobilization, kinesiology taping, and corrective therapeutic exercise.

Though it is not often that the opportunity arises to practice cupping on a canine rehabilitation patient, it has potential to be an effective treatment modality. The ideal patient characteristics for application of RockPods include a short coat, with functional limitations or impairments associated with myofascial restriction generally located on the dorsal, dorsolateral or lateral torso, abdomen, and/or extending lateral to the proximal thoracic or pelvic limbs. The patient's temperament can also be a contributing factor for tolerance (and successful use) of the modality. The following is a description of a series of 2 canine rehabilitation cases, which met those basic criteria, in which RockPods were successfully used as part of a comprehensive therapy approach, per a proposed treatment protocol established in the previous publication.

Case Study 1: Barney, an 11-year-old neutered male Boxer

Barney initially presented for rehabilitation on April 17, 2021 with lameness suspected to be due to a chronic biceps tendinopathy, neoplasia, or shoulder muscle strain. No formal rehabilitation had been undertaken despite initially being referred upon consultation at his primary care veterinarian on June 17, 2020, when he first presented with intermittent weight bearing lameness. Barney had been medically managed with cartrophen injections, weekly carprofen (Rimadyl), and paracetamol (Panadol). (The referring veterinarian noted that the latter product was prescribed for short term/interim use only as off-label). He was also being given "golden paste," a turmeric supplement. The owner had been walking Barney up to 45 minutes daily.

Objective Examination

Behavior: Calm to unsettled.

BCS: 6/9[1]

Stance: Slightly cranial weight shift, bilateral forelimb and hind limb carpal and tarsal drop ("rabbit foot").

Gait: Even and slow with low head carriage and flat top-line to mild head bob on left forelimb weight bearing.

Forelimb palpation and ROM: No pain on palpation bilaterally at shoulder, biceps tendon, elbow, or carpus (and at subsequent sessions) with reduced ROM in flexion and extension. (This was assumed to be due to osteoarthritis due to Barney's age.) Subjectively, muscle development was noted to be average, given his age.

Spinal palpation: Severe restriction was noted at the dorsal/dorsolateral thoracolumbar to lumbosacral musculature with "adhesion" of fascia to the underlying muscle layer.

Goals and Treatment Plan

It is hypothesized that the forelimb lameness was a secondary issue related to chronic thoracolumbar and lumbosacral pain. The plan was to use massage, Bowen therapy, mobilization, LASER,[2] acupressure, traction, passive range of motion (PROM), stretching, and cupping to address:

- Thoracolumbar and lumbosacral tightness/stiffness and soft tissue trigger points and adhesions.
- Thoracolumbar and lumbosacral pain.
- Forelimb lameness.

Treatment Summary and Patient Response

Rehabilitation treatment was initiated as shown in the photos (bottom of page 312). Additionally, as part of the home program, the owner was advised initially to reduce walk duration to 10 minutes on-lead twice daily.

Following the first session, the rehabilitation practitioner chose to use RockPods (in addition to other modalities) to reduce tension and trigger points in the muscles of the thoracolumbar and lumbosacral area.

On the first occasion in which RockPods were used, session #2, Barney was initially unwilling to stand, lie, or remain still. Two large RockPods cups were placed over bilateral iliocostalis and 4 small cups over bilateral longissimus in the lumbar region. The cups were applied with a plunger technique with ultrasound gel applied generously to the edge of the cup rims and left in a static position for approximately 4 minutes. Barney settled a couple of minutes after all cups were placed and lay still for the remainder of the session. After approximately 4 minutes, the first cup naturally decompressed and fell off the treatment area, at which time the remaining cups were gently manually removed by squeezing the bell on opposite sides of the RockPod to release the suction.

Following treatment, the rehabilitation practitioner palpated the iliocostalis and longissimus muscles, noting reduction in severity of muscle tension and trigger point latency.

At the third rehabilitation session, 2 weeks later, the practitioner noted moderately tight brachiocephalicus and cleidomastoideus with trigger points within the muscle bellies, and active trigger points at bilateral L2-4 longissimus and transversus abdominus.

Two large RockPod cups were placed over the bilateral lateral iliocostalis and 2 small cups over the bilateral longissimus in the same manner as previously. Additionally, the practitioner applied gentle lifting of the cups with gentle circular rotations while maintaining suction, for 30 second repetitions. Upon removal of the cups, the tight muscle groups as noted above, were reduced to moderate tightness.

The practitioner attempted to place the large cup over the trigger point of the right brachiocephalicus and cleidomastoideus, however, compression or suction of the cup was not successful due to underlying curvature of the muscle surface.

Treatment Summary and Patient Response

Modalities	Session 1	Session 2	Session 3	Notes
Massage	x	x	x	Effleurage, palmar rotations, cross friction, skin rolling, and raking to bilateral thoracolumbar and lumbosacral epaxials (T10-11 to L7-S1) & latissimus dorsi, hamstrings and gluteals.
Bowen therapy	x			Lumbar, midback, and sacral sequences.
Traction	x			Tail rotations and traction.
Laser (Class IIIb)	x	x	x	SpectraVet 904-200SP: CW 60s 12J/point. SpectraVet 810-500: CW 60s 30J/point. To bilateral shoulder intra-articular joint capsules and dorsal intercostal spaces at T12-L7 and dorso-lateral internal and external obliques.
Mobilizations		x	x	Grade I-II dorsoventral and lateral spinal mobilizations T10-S1.
Acupressure		x		BH/GV20, GB29/GB30/Bl54, St36, Ki27, Bl23, Sp21
Cupping		x	x	Over lumbar epaxial muscle trigger points for ~4 minutes per point.
ROM/Stretches		x	x	Forelimb/hindlimb flexion/extension x3 with a 30 second hold at endrange.

Re-evaluation Findings

Following the cupping therapy sessions, Barney's owner reported that he had "run off to the neighbor's for the first time in months" and that he was "running around a couple of times" between the sessions. (Prior to initiating rehabilitation, Barney had "been too lame" to run.) The rehabilitation practitioner also noted an increase in sagittal shoulder extension by about 50%. The practitioner advised the owner to review Barney's pain management medications with the veterinarian.

Acupressure points used in the second treatment session were referenced from this image.[3] Reprinted with permission from Tallgrass Animal Acupressure Resources.

Case Study 2: Billy, a 13-year-old neutered male Greyhound

Billy was referred by the veterinarian to rehabilitation for treatment of chronic back pain, possibly due to IVDD. He had received Cartrophen injections for 3 months and was prescribed gabapentin and Previcox (firocoxib). At the time that he initiated rehabilitation, Billy was walking approximately 10 minutes daily, though was noted to struggle to walk longer or further, as the owner noted that Billy seemed to enjoy his walks. It was noted that Billy would drag his hind limbs, scuffing his nails. Previous medical history included a right hind limb 0.5cm cutaneous hemangiosarcoma removed from the proximal caudal thigh and another lump (without pathologic examination) removed from the left forelimb lateral caudal pad.

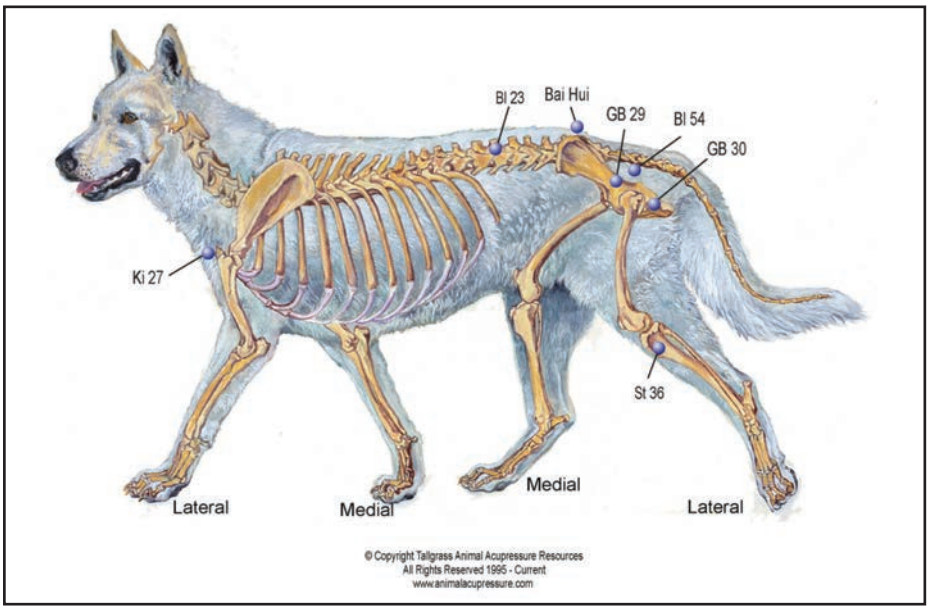
Objective Examination

BCS: 4/9 (1)

Stance: Stable weight bearing with occasional hindlimb incoordination and imbalance, causing the hindlimbs to cross over with off-loading of alternate hindlimbs.

Gait: At a walk, Billy had a "fluid" gait, but with mild right hind limb ataxia. On turning right, Billy would initially hop, non-

Barney during cupping therapy.



Acupressure points used in Barney's second treatment session were referenced from this image. Reprinted with permission.

weight bearing on the right hind limb. His forelimbs were positioned more midline than expected during the stance phase of gait and his hind limbs were positioned more laterally during stance phase.

Orthopaedic: His tail was tucked between hind limbs, unable to actively or passively extend it.

PROM: Reduced carpal flexion with crepitus and thickening palpated at the joint line.

Muscle tone: 2/5

Atrophy: 2/5 generally to hamstrings and quadriceps, infraspinatus and supraspinatus. (Using subjective scales for tone: 5/5 being hypertonic, 1/5 hypotonic; and Atrophy: 1/5 minor atrophy. 5/5 major atrophy.)

Palpation: Trigger points palpated at right longissimus T10-L5 with muscle tension (guarding) noted along the bilateral lumbar paraspinals and bilateral quadratus lumborum.

Behaviour: social, active, and inquisitive

Goals and Treatment Plan

It is hypothesized that the functional limitations (reduced walking distance/duration) and reduced quality of life are due to lumbosacral pain. The plan was to use massage, Bowen therapy, mobilization, LASER,[2] acupressure, traction, PROM, stretching, kinesiology taping, and cupping to address:

- Thoracolumbar and lumbosacral tightness/stiffness and soft tissue trigger points/adhesions.
- Thoracolumbar and lumbosacral pain.
- Lumbosacral muscle tightness.
- Restricted passive tail extension due to lumbosacral pain.

Treatment Summary and Patient Response

Treatment was initiated (see 2 photos to the right).

Cupping was used during Billy's first 2 rehabilitation sessions to reduce tension and trigger points in the muscles of the lumbar region, from approximately T13-L6. Four large RockPod cups were applied with a plunger technique to the bilateral lumbar longissimus muscles with ultrasound gel emollient applied generously to edge of cup rims. The rehabilitation practitioner alternately applied gentle traction with circular rotation of the cup bells for 30 second repetitions. Fasciculations were observed cranial to the cups on the right-side following initiation of rotations and repeated after the rest phase. Upon removal of the cups, following 2 minutes of treatment, palpation revealed reduction in tightness of the epaxial muscles of the lumbar region. Upon removal of the cups at the following session, moderate tension was noted to be further reduced to mild tension.

Billy during cupping and LASER therapy.

Re-evaluation Findings

Over the course of 3 sessions, the rehabilitation practitioner noted improvements in Billy's impairments and functional limitations, including:

- Fully weight bearing through all limbs during standing.
- Independent rising from sitting.
- Reduced stiffness, including improved spinal extension.
- Able to negotiate stairs.
- Able to climb in and out of a raised trampoline bed.
- Able to run and play in the yard.
- Able to trot with reduced knuckling of hind limbs.
- Passive extension of tail perpendicular to ground plane.
- Able to tolerate walks up to 30 minutes.
- In general, Billy's behaviour improved, and his owner noted that he seemed "happier."

Treatment Summary and Patient Response

Modalities	Session 1	Session 2	Session 3	Notes
Massage	x	x	x	Effleurage, palmar rotations, cross friction, skin rolling, compressions, and raking to bilateral epaxials (T1-L7), infraspinatus, supraspinatus, hamstrings and gluteals.
Bowen Therapy	x			Lumbar, midback sequences.
Traction			x	Tail rotations and traction.
Laser (Class IIIb)	x	x		SpectraVet 904-200SP: CW 60s 12J/point; along bilateral dorsal longissimus/epaxials T13-S1.
Mobilizations	x	x	x	Grade I-II dorsoventral and lateral spinal mobilizations; T7-L7 and bilateral cranial/caudal, dorsal/ventral scapulothoracic mobilizations.
Acupressure	x	x		BH/GV20, Bl10, Bl11, Bl13, Bl15, Bl23, GB29/GB30/Bl54, St36, LI4, He6/Pe7, LI11 Ki27, Sp21
Cupping	x	x		Over lumbar trigger points, 2 minutes per point.
ROM/stretches		x	x	Forelimb/hindlimb flexion/extension x3 hold 30 seconds.
Kinesiology taping	x			Y taping to lumbar spine with anchor point over sacrum and extending bilaterally over longissimus dorsi.

CONCLUSION

Cupping, through use of RockPods, can be an effective compressive-decompressive technique complementing traditional manual therapies for symptomatic treatment of pain, trigger point, and generalized muscle tension. It is unknown as to the duration of positive effects of cupping alone or if it can enhance the effects of other modalities such as massage, manual therapy, traction, LASER, or kinesiology tape as

Billy during cupping therapy and following application of kinesiology tape.

these treatments were used in combination with cupping therapy in this small case series of two. Further examination of the feasibility and effects, both short term and long term, of this modality in canine rehabilitation with suitable candidates is suggested and encouraged in combination with a comprehensive evaluation of objective functional outcomes and in collaboration with veterinary health care professionals.

RESOURCES

1. Nestlé Purina. "Body Condition System."
2. Jenkins, Peter A. "SpectraVet Pro2 Small Animal Protocols V1.5i". 2020.
3. Tallgrass Animal Acupressure Resources (1995-present).
4. Photographic images by author (MY).

Index to Advertisers

TISSUE TOLERANCES

Independent Study Course 30.2

Learning Objectives

1. Understand muscle and tendon anatomy and biomechanics.
2. Interpret the physiological mechanisms and processes associated with pathologic muscle and tendon tissue to clinical care.
3. Describe clinical and diagnostic tools used in identifying muscle-tendon abnormality.
4. Apply the current body of evidence underlying the physical therapy management for injury to the muscle-tendon unit.
5. Know how to apply concepts to improve the tolerance of muscle-tendon tissue to load, and implement such concepts to injury prevention strategies.
6. Describe the anatomy and physiology of a healthy ligament and capsular tissue.
7. Describe the pathophysiological processes that occur in the event of an injury to ligament or capsule.
8. Identify the phases of healing following a ligamentous injury.
9. Apply pathophysiological concepts of ligamentous integrity to the examination and treatment of specific conditions for the extremities.
10. Understand the structure and functional rigor of articular cartilage.
11. Appreciate the scientific basis of why cartilage regeneration is limited.
12. Describe the most common mechanisms for articular cartilage damage.
13. Describe the link between articular cartilage damage and early osteoarthritis.
14. Describe the medical interventions currently used in the repair of articular cartilage.
15. Specifically apply rehabilitation goals and precautions for patients who have undergone patellar and femoral articular cartilage repair.

Editorial Staff

Christopher Hughes, PT, PhD, OCS, CSCS—Editor
Gordon Riddle, PT, DPT, ATC, OCS, SCS, CSCS—Associate Editor
Sharon Klinski—Managing Editor

For Registration and Fees, visit orthopt.org
Additional Questions—Call toll free 800/444-3982

Description

This course will provide the clinician with an appreciation of the structure and function of tissue and its tolerance for injury and its potential for healing. Physiological concepts and biomechanics are covered for muscle and tendon, ligament and capsule, and articular cartilage. Each author brings a unique perspective for how to integrate basic science to clinical scenarios. An interesting array of cases accompanies each monograph. The cases serve to facilitate clinical decision-making and to provide examples of evaluation and treatment. This is a unique course series that should satisfy the scientific and clinical curiosity of every clinician.

Topics and Authors

Tissue Tolerances of the Muscle-Tendon Unit
Dhinu J. Jayaseelan, DPT, OCS, FAAOMPT

Tissue Tolerances of the Ligament and Capsule
Katherine Wilford, PT, DPT, Cert. MDT;
Hazel Anderson, PT, DPT, Cert. MDT;
Navpreet Kaur, PT, DPT, PhD, MTC;
Manuel A. (Tony) Domenech, PT, DPT, MS, EdD, OCS, FAAOMPT;
Nicole P. Borman, PT, PhD, MTC, OCS, CSCS

Tissue Tolerances of the Articular Cartilage
Ann Smith, PT, DPT, OCS, PCS

Continuing Education Credit

Contact hours will be awarded to registrants who successfully complete the final examination. The Academy of Orthopaedic Physical Therapy CEUs are accepted by the majority of state physical therapy licensure boards as allowed by the type of course requirements in state regulations. For individual state requirements, please visit your state licensure board website.

Course content is not intended for use by participants outside the scope of their license or regulation.

ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY

APTA American Physical Therapy Association

Orthopaedic Physical Therapy Practice
2920 East Avenue South, Suite 200
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ACADEMY OF
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