# ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

The publication of the Academy of Orthopaedic Physical Therapy, APTA

### FEATURE: Identification and Management of Venous Thromboembolism in a Patient Following Anterior Cruciate Ligament Reconstruction: A Case Report



## PHYSICAL THERAPY MANAGEMENT OF TENDINOPATHIES

Independent Study Course 32.1

### **Description**

This course provides clinicians with an update on models of tendinopathy with special attention to differentiating between primary versus secondary tendinopathies and the features of acute versus chronic tendinopathies. Four common tendinopathies are then thoroughly discussed, each with its own monograph: Achilles, patellar, gluteal, and lateral elbow tendinopathy. Each monograph provides in-depth knowledge of general and tendon-specific principles of evaluation and management techniques/strategies. Through these monographs, the reader will appreciate that loading exercises, while important, are only one aspect of the successful management of individuals with tendinopathy. Finally, each monograph ends with 3 or 4 case scenarios selected to demonstrate the variety in presentation and management of this potentially complex and clinically challenging condition. Monographs are supplemented by extensive figures related to the educational and exercise components of the rehabilitation process.

### **Topics and Authors**

Basic Science and Pathophysiology of Tendons Alex Scott, PhD; Jonathan Rees, MSc, MRCP (UK), FFSEM (UK)

Lateral Elbow Tendinopathy Leanne Bisset, PT, PhD, MPhty; Brooke Coombes, PT, PhD, MPhty

Patellar Tendinopathy Andrew Sprague, PT, PhD, DPT; Terrence McHugh, PT, DPT, SCS, ATC; Rick Joreitz, PT, DPT, SCS, ATC

Achilles Tendinopathy Karin Gravare Silbernagel, PT, PhD, ATC; Jennifer Zellers, PT, DPT, PhD

**Gluteal Tendinopathy** Alison Grimaldi, PhD, MPhty (Sports), BPhty



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### **Learning Objectives**

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

- 1. Understand typical biomechanical principles associated with normal tendon function and implications for dysfunction.
- 2. Understand the pathophysiological factors underpinning the development of tendinopathy in general, with special attention to Achilles, patellar, gluteal, and lateral elbow tendinopathy.
- 3. Explain the range of prognoses for common tendinopathies and clinical features that may influence outcomes.
- 4. Implement an evidence-based approach to select tests and measures and examination techniques to inform differential diagnosis of tendinopathies in general, with special attention to Achilles, patellar, gluteal, and lateral elbow tendinopathy.
- 5. Demonstrate an understanding of the evidence for various types of exercise treatments for patients with Achilles, patellar, gluteal, and lateral elbow tendinopathy.
- 6. Devise and implement evidence-based exercise progressions based on objective findings and scientific evidence for patients with Achilles, patellar, gluteal, and lateral elbow tendinopathy.
- Develop an individualized, comprehensive, rehabilitative plan of care for Achilles, patellar, gluteal, and lateral elbow tendinopathy based on objective findings, symptom irritability, and activity considerations.

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Publication Title: Orthopaedic Physical Therapy Practice Statement of Frequency: Quarterly; January, April, July, and October Authorized Organization's Name and Address: Academy of Orthopaedic Physical Therapy, 2920 East Avenue South, Suite 200, La Crosse, WI 54601-7202

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Bob Rowe, PT, DPT, DMT, MHS

The holiday season is a time for self-reflection and provides opportunities to catch up with friends and colleagues that I haven't spoken with in far too long. One conversation in particular really struck me and led me down a path of deep reflection. I spoke to a very close physical therapist friend of mine who I had known for many years, who had an incredible servant spirit to provide his patients with everything he had every day. He confessed that he was feeling "burn out" and was struggling to go to work on most days. We talked about the potential reasons, he mentioned a few things that might be the cause, and not surprisingly administrative burden was a significant factor. It was clear to me that the fire that had once burned inside of him was gone. Another word for that "fire" is Passion.

Why is passion important? If passion is present within an individual, that person is more likely to have greater resiliency when encountering barriers. People who are passionate about what they do, rather than just being "in it for the money," tend to be people who have more positive outlooks and can overcome difficulty through problemsolving. Simon Sinek states "*working hard for something we don't care about is called stress; working hard for something we love is called passion.*"

What is the relationship and role of passion when it comes to motivation? The concept of passion as a motivator seems to be overused these days, but it remains an important part of motivation. The greater the passion within an individual, the more likely they are to accomplish their goal.

Passion and motivation are very closely related, but they are also independent of each other. Passion is an intense interest in something. In its original derivation, having passion for something meant that you felt so

### President's Perspective Passion and Motivation

strongly about it that you would be willing to sacrifice your life for it. Motivation is the desire to achieve a goal or a result. For example, a mother may not be passionate about her job, but she is motivated to keep working to provide for her family.

However, when you combine passion and motivation together, you have an incredibly strong combination that will frequently lead to positive outcomes! The combination of passion and motivation is described to provide the following advantages:

- It keeps the individual fired up, focused, and motivated.
- It keeps the work being done fun.
- It inspires others to want to join and many hands make light work.
- The individual will be more productive.
- Given all of the items listed above, the individual will be more successful!

What is it that caused my friend, or anyone to lose their passion? The most common causes listed in the literature include the following: (1) you don't feel like you are bringing value to the situation, (2) you are being overworked, and/or (3) loss of enjoyment in what had once brought you great joy. It is obvious to see how these three items are very closely linked. When you consider these three items, how closely do they relate to so many of us in clinical practice today?

Here are the problems we are facing every day in the clinic:

- Patient complexity is increasing secondary to greater numbers of patients presenting with multiple and more complex co-morbidities.
- The paucity of high quality, evidencebased literature to provide guidance for our patient management.
- The tremendous administrative burden being placed on us by regulatory agencies, payers, and to a certain extent by ourselves secondary to risk management concerns.
- Extremely aggressive productivity requirements to make up for the ridiculously low payment provided to us for the services we provide.
- There are more, but this is enough to make my point!

There are some strategies suggested to assist in getting the Passion back:

- Keep focused on what truly motivates you.
- Identify the driver for your primary purpose.
- Eliminate the negatives.
- Keep it simple and stop overthinking it.
- Identify and reconnect with your core values.
- Spend time each week focused on activities related to your passion.
- Remember the good times and the things that brought you joy in the past.
- The reason you are doing this is to help others.

Finally, I wanted to share some initiatives that the AOPT is doing for each of you to assist with the problems that we all face every day in the clinic. The really big announcement (previously emailed to you on 10/11/22) is the formation of our partnership with APTA Private Practice to form the Payment Consortium. The Payment Consortium is an equal partnership in terms of its governance and financial support between the AOPT and APTA Private Practice (see the announcement for more details). You will be hearing more about this Consortium as it begins its work with an inaugural meeting in February 2023. In addition, we have gone through a reimagining of the AOPT Practice, Education, and Research Committees that has led to a restructuring for each of those committees, in order to improve the quantity and quality of services we will be able to provide for our members. The new structure for each committee will be shared at CSM 2023. Honestly, there is so much more to share, but I am out of space, so please come to the Membership Business Meeting at CSM 2023 in San Diego to learn more about the latest initiatives we are doing for you!

I am happy to answer your questions and I thank you for your support as we move forward with improving the practice environment for each of you!

> Best Regards, Bob

### To Shake or Not to Shake?

"Shake it up, make a scene Let them know what you really mean And dance all night, keep the beat And don't you worry 'bout two left feet Just shake it up, oo, oo Shake it up, oo oo, yeah Shake it up, oo, oo Shake it up, oh, yeah"

—The Cars

One of the trends that I am observing in orthopaedic/sports clinics all over is the use of percussion or vibration for soft tissue mobilization. In the clinic where I work, we commonly call for "the gun" which is appropriate for the Wild West in Arizona! In this editorial, I would like to point out the pros and cons of the use of this device, as well as what is found in the literature about this intervention. I offer this editorial for your consideration only and I have no conflict of interest to declare regarding this intervention.

When performing a search on this topic, there are multiple names for this intervention, including "percussion," "vibration therapy," "percussion gun," "percussive massage gun," "neuromuscular vibration therapy," "mechanical vibration," "massage gun," and "vibrating massage gun." Wow, a lot of terms for a device that provides rapid, strong, short-term pulsating strokes similar to a small jackhammer.

Clinically, physical therapists have noted that using this intervention saves their hands, specifically their thumbs, carpometacarpal joint, and the metacarpophalangeal joints. Many therapists have hypermobility in these joints from countless hours of manual therapy techniques that compromised these joints.

A negative of this intervention is the reliance on this device instead of the hands. It takes time for a physical therapist to develop the ability for their hands to recognize soft tissue impairments and to feel the differences between articular pillars of a joint that does not move compared to a joint with normal movement. I remember learning in my entry level program that a famous physical therapist suggested that our hands should be so sensitive that we should be able to detect the nose of Thomas Jefferson on a nickel and even progress to the smaller dime to locate the nose of Franklin D. Roosevelt! I don't ask my students to do that, but I can sure appreciate the detail and usefulness of this advice now.

What do clinicians use these percussive or vibration devices for and what guides treatment parameters? A 2021 survey of 425 members of the National Athletic Training Association, Academy of Orthopaedic Physical Therapy, and American Academy of Sports Physical Therapy members suggest that a low to medium setting is preferred for a total treatment time of 3-5 minutes to attempt to increase local blood flow and modulate pain.1 The majority of those surveyed noted that they chose this intervention because their colleagues use it in the clinic.1 The authors of the survey noted no consistency in treatment parameters, with vibration frequencies ranging from 5-300Hz and treatment durations lasting from 6 seconds to 60 minutes.1 These wide ranges don't make sense to me! I don't think I could tolerate more than 15 minutes of this intervention and what would that achieve?

What does the literature say about this intervention? Percussion devices typically achieve contact 40 times per second whereas vibration devices operate typically at 120 times per second.<sup>4</sup> The benefits of this intervention have been reported in the literature to stretch muscles and connective tissues, reduce soft tissue pain, improve blood circulation to an affected area, enhance recovery and overall physical performance, stimulate satellite myoblasts, decrease muscle soreness and Interleukin-6 levels, and reduce muscle stiffness.<sup>3</sup>

Of interest, a recent case report of a 25-year-old female that developed rhabdomyolysis after 10 minutes of percussion to her bilateral thighs to alleviate delayed onset muscle soreness after cycling should be considered.<sup>2</sup> It is important to note that the percussion in this case report was performed by her coach and not by a therapist. It is also important to consider that the patient had an underlying untreated iron deficiency anemia that the authors suggest may have led the patient to complain of pain that evening and then 2 days later, the pathognomonic sign of dark brown or tea colored urine.<sup>2</sup> The young lady spent 2 weeks in the hospital to be treated for rhabdomyolysis with a positive outcome.



Most of us in an outpatient orthopaedic/ sports setting would not likely know that the patient we are using the percussion gun on has an underlying undiagnosed circulatory condition. Case reports are interesting cases to consider because they help us study conditions that expand our clinical decisionmaking boundaries. Whether you decide to shake it up or not shake it up is entirely up to you!

We welcome your comments and appreciate all that you do for your patients. You can reach me at John.Heick@nau.edu

> Respectfully submitted, John Heick, PT, PhD, DPT Board-certified in Orthopaedics, Sports, and Neurology

### **REFERENCES**

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### Identification and Management of Venous Thromboembolism in a Patient Following Anterior Cruciate Ligament Reconstruction: A Case Report

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### ABSTRACT

Background: Venous thromboembolism may be an under-appreciated complication of arthroscopic orthopaedic procedures in the rehabilitation setting. The purpose of this case report is to describe the physical therapist's role in identifying and managing venous thromboembolism (VTE) alongside rehabilitation following anterior cruciate ligament reconstruction (ACLR). Case Description: The patient was a 40-yearold male who presented to physical therapy following right knee arthroscopic ACLR and medial/lateral meniscectomy. Approximately 2 weeks post operatively, he developed bilateral lower extremity deep vein thromboses (DVTs). The patient received manual therapy, exercise, and education regarding DVT. Outcome: The patient was discharged after 43 visits over 7 months. The patient's Focus On Therapeutic Outcomes (FOTO) score improved from 30 to 85 out of 100. The patient had no recurrent DVT or development of further complications over the final seven months of treatment. Discussion: This case report highlights important considerations for the identification and management of DVT during rehabilitation following ACLR. Clinical Relevance: Physical therapists should use validated tools to screen for DVT in patients following ACLR and integrate DVT management alongside ACLR rehabilitation as indicated.

**Key Words:** knee pain, medical screening, deep vein thrombosis, evaluation

### **INTRODUCTION**

Anterior cruciate ligament reconstruction (ACLR) surgery is an arthroscopic procedure in which the surgeon replaces the torn ligament with a graft. Complications after

an ACLR can include deep vein thrombosis (DVT), hemarthrosis, effusion and synovitis, infection, and arthrofibrosis.<sup>1,2</sup> The incidence of DVT after ACLR in patients who did not receive postoperative prophylactic pharmacological anticoagulation is 8.4%, while the rate of symptomatic pulmonary embolism (PE) is 0.2%.3 These data suggest that, on a population basis, DVT and PE are relatively common occurrences after ACLR. Deep vein thromboses may be present in the lower extremity (LE), upper extremity, and lung, and risk factors for each presentation differs.<sup>4</sup> Lower extremity DVT risk factors include previous venous thrombosis or embolism, age, active cancer or cancer treatment, severe infection, oral hormonal contraceptives, replacement therapy, pregnancy or given birth within the previous 6 weeks, immobility (bed rest, flight travel, fractures), surgery, anesthesia, critical care admission, central venous catheters, inherited thrombophilia, and obesity.4

Hillegass et al4 established a clinical practice guideline (CPG) on the role of physical therapists in the management of individuals at risk for or diagnosed with venous thromboembolism (VTE). In this CPG, algorithms were developed to assist clinicians with clinical decision-making. The purpose of this case report is to provide insight into the role of physical therapists in identifying and managing a patient with diagnosed LE DVT while rehabilitating following orthopaedic surgery in an outpatient setting. Applying established CPGs in the management of individuals at risk for or diagnosed with VTE, and highlight important considerations when managing these individuals.

### CASE DESCRIPTION Initial Evaluation Patient interview

The patient was a 40-year-old male who presented to physical therapy 2 weeks status post right knee arthroscopic ACLR using quadriceps tendon autograft and medial/ lateral meniscectomy following a softball injury. At initiation of physical therapy, the patient's chief concern was right knee pain and edema. The patient described his symptoms as throbbing, aching, burning, shooting, sharp, cramping, and gnawing with 8/10 pain at worst and 1/10 pain at best on the numeric pain rating scale, with 0 representing no pain and 10 representing the worst pain imaginable. Medical history included elevated body mass index (BMI) of 33.7, history of varicose veins, and history of hemorrhoids. Family history included heart disease. The patient's father died of a stroke; the age at death was unavailable. The patient's medications included allertec, meloxicam (15 mg once daily), Tylenol (500 mg as needed), and Norco (300 mg as needed). Prior to injury, the patient participated in regular exercise (gym visits 2-4 times/week) and multiple recreational activities (bowling league, softball, etc). Patient was a full-time business analyst and had a positive support system (wife and 2 children). His goals were to return to a prior level of function and participate in all recreational activities without restriction.

At the physical therapy intake (2 weeks post-op), the patient completed the knee FOTO survey that identifies the functional ability of the patient (Table 1; based on the Physical Therapy Clinical Reasoning and Reflection Tool<sup>8</sup>). The FOTO is a validated functional outcome tool and the scores range from 0-100 with greater scores indicating better function. Minimal clinically important difference is 19 points and minimal detectable change is 9 points. The patient's Physical Functional Status Primary measure was 30 out of 100, which indicates 70% limitation in function. The patient's predicted Functional Status score at discharge was 66 out of 100 that indicates 34% limitation in function.

#### Examination

The patient used bilateral axillary crutches to ambulate and was non-weight bearing through the right LE. The patient presented with right knee pain and moderate edema in right knee, calf, ankle, and foot. Right knee active range of motion (ROM) was limited (0-11-60°). Surgical incisions surrounding the right knee were without **Table 1.** The Physical Therapy Clinical Reasoning and Reflection Tool<sup>8</sup> for this Patient Based on Information From Initial Evaluation, Re-evaluations, and Other Members of Healthcare Team



signs and symptoms of infection. No strength measurements were obtained due to acute post-surgical status. The patient demonstrated normal active lumbar ROM in all planes and normal passive right hip ROM. The patient had tenderness to palpation from the right distal quadriceps musculature to the right talocrural joint, with the most tenderness located near the right quadriceps tendon.

### Assessment and plan

The patient received education regarding assistive device use, pain management, edema management, timeline for rehabilitation, and patient expectations/perceived outcomes. The patient was provided with a home exercise program consisting of exercises to improve knee flexion and extension and for quadriceps/hamstring activation. The patient was seen twice a week for 6 weeks in the clinic.

### Re-evaluation #1 (3 Weeks Post-operative) Patient interview

The patient returned to the clinic for a routine physical therapy treatment and re-

vealed he had been hospitalized over the preceding weekend. The patient described that he woke up one morning with acute severe left leg pain with an inability to move his left LE. Upon examination at the emergency department (ED), the patient had pallor, numbness and no obvious dorsalis pedis pulse in the left LE. A computed tomography angiogram of the abdominal aorta with runoff was performed. Imaging of the left LE (initially unaffected side) revealed thrombus and occlusion of the internal iliac artery, distal common femoral artery, proximal profunda femoris, and superficial femoral artery. Imaging of the right LE (initially affected side) revealed thrombus and occlusion of the tibioperoneal trunk. Patient was admitted to the hospital and underwent emergency left femoral thrombectomy, which resulted in good restoration of blood flow. The patient's right tibial peroneal artery occlusion did not exhibit any symptoms and he had palpable pulses, so the patient was discharged from the hospital with anticoagulation therapy and a referral to a cardiologist and hematologist for follow ups and further consultations. The patient was prescribed Eliquis (5 mg 2x/ day) and aspirin (81 mg daily). The ED physicians' differential diagnosis regarding the source of the bilateral arterial thrombosis included cardiac involvement versus presence of a hypercoagulable state potentially due to his positive family history of cardiovascular disease. The patient had a consultation with a hematologist. Blood work revealed no evidence of a hypercoagulable state. The patient also had a consultation with a cardiologist. Imaging revealed a mildly dilated aortic root but no other cardiac pathology. The cardiologist recommended periodic monitoring for the dilated aortic root. No clear source of the bilateral arterial thromboses was determined. Patient was cleared for participation in physical therapy from the hematologist, the cardiologist, and the vascular surgeon with no restrictions or precautions.

### Examination

The patient had a 3-inch incision near his left groin from the left femoral thrombectomy. No signs/symptoms of infection were present. The patient continued to have limited right knee ROM (0-10-45°).

#### Assessment and plan

The patient's home exercise program was modified to eliminate activities placing stress on the left groin. He was instructed to continue with his home exercise program with new modifications.

### Re-evaluation #2 (6 Weeks Post-operative) Patient interview

The patient was re-examined in the physical therapy clinic 6 weeks following ACLR. He voiced concern regarding increased edema in the right LE and pain in the right posteromedial knee.

#### Examination

The patient ambulated with a unilateral axillary crutch and an antalgic gait pattern consisting of decreased stance phase on the right LE, as well as inability to achieve adequate knee extension during initial contact, mid stance, terminal stance, and terminal swing phases of the gait. Pain and ROM deficits caused a forefoot first contact during initial contact phase of gait. The patient had visible edema about the right knee, calf, and ankle, which was significantly increased from prior physical therapy sessions. He continued to have limited right knee ROM (0-5-85). There was tenderness to palpation along the right posterior thigh, knee, and calf. The severe pitting edema was noted in the right ankle, which scored 4+ on the pitting edema scale. The pitting edema scale is a widely used grading system used to assess and determine the severity of peripheral edema (**Figure 1**).<sup>19</sup>

The Wells' Criteria for DVT was used to determine risk stratification for possible DVT and need for further referral. The Wells' Criteria is a validated scoring system used for stratifying patients into risk categories for possible presence of a LE DVT, based on clinical data that usually is simple to obtain.5-7 It is the most widely used standardized tool to determine the likelihood of a LE DVT in the outpatient physical therapy setting.5-7 The original Well's criterion stratifies patients into high, moderate, and low risk for DVT.5-7 A score of 0 or less indicates low probability of DVT, 1-2 indicates moderate risk of DVT, and 3 or higher indicates a high risk of DVT.5-7 In 2000, the Wells' criteria for LE DVT were modified to a 2-stage stratification (LE DVT likely or LE DVT unlikely), and a history of previous LE DVT was added to the tool.8

Wells' Criteria are based on a combination of clinical findings and risk factors, as well as the clinician's assessment of the likelihood of an alternative diagnosis. The clinical findings include calf swelling >3 cm compared to the other LE, whole LE swelling, tenderness of the venous system on the affected side, and pitting edema confined to the affected LE. A maximum score on the clinical findings or a maximum score on the risk factors may generate a Well's score of high risk, assuming there is no alternative diagnosis as likely or more likely than DVT. Individuals with 2 or more points were categorized as likely, and those with less than 2 points were categorized as unlikely.8 The patient scored a 4 on the

original Wells' Criteria, which indicated a high risk for DVT.<sup>8,9</sup>

#### Assessment and plan

Based on the patient's score on the DVT screening tool, the patient was categorized into a high risk of DVT category, and was referred to the ED for further work up. At the ED, the patient had a venous Doppler ultrasound, which was positive for an occlusive right LE DVT extending from the proximal to mid femoral vein to the mid posterior tibial vein. Patient was discharged from the ED with instructions to continue anticoagulation therapy and physical therapy. Patient resumed physical therapy with no additional precautions/restrictions.

### **EVALUATION**

Based on the data extracted from the initial physical therapy examination/evaluation, the physical therapy re-examinations, and further testing at the ED, patient presentation matched with a post-operative ACLR with concomitant right LE DVT. Using the Physical Therapy Clinical Reasoning and Reflection Tool, patient information was categorized into various sub-groups based on the ICF framework (Table 1).10 The patient demonstrated various deficits in body structures and function, including increased edema due to post-surgical status and the presence of a DVT impacted the patient's body structures/function. The patient was unable to achieve full right knee ROM, which resulted in limited muscular strength/endurance (most notably the right quadriceps musculature). The limitations at the body structures/function level of the World Health Organization's International Classification of Functioning, Disability,

and Health (WHO-ICF) model were hypothesized to lead to limitations at the activity and participation level of the WHO-ICF model.<sup>10</sup> Activity limitations were due to observed limited active and passive limitations to right knee ROM leading impaired gait to mechanics.

The patient was unable to achieve terminal knee extension, which impacted initial contact, mid stance, terminal stance, and terminal swing phases of gait. The patient had difficulty with squatting, lifting, driving, and performing heavy activities around the home (yard work, etc). In turn, the patient was hypothesized to have difficulty with returning to participation in recreational activities (softball, bowling) due to the edema, ROM deficits, and limited muscular strength, endurance, and power. In addition, the patient's internal environmental factor of high stress regarding the multiple venous thromboses of unknown origin was hypothesized to negatively impact his psychological readiness for return to sport.

### **PROGNOSIS**

Patient was hypothesized to have a favorable prognosis due to his previously active lifestyle, early identification of LE DVT and implementation of medical/ pharmaceutical management, motivation to return to prior level of function, and excellent compliance with physical therapy attendance and home exercise program participation.

### **INTERVENTION**

The patient received 43 physical therapy treatment sessions over a 7-month period. The patient was educated on the pertinent physical therapy examination and evaluation findings, prognosis, and plan of care.

The limited right knee flexion ROM was addressed with active assistive and active exercises using towel-gapping techniques to improve joint related restrictions. The limited right knee extension ROM was addressed with passive low-load long duration stretching techniques, active assistive, and active exercises. Muscular endurance deficits were addressed with progressive recumbent bicycle and treadmill walking program. Muscular strength was addressed through progressive overload of functional movements (squats, lunges, stepups, deadlifts, etc).

Proprioceptive/neuromuscular control deficits were addressed through single leg static, dynamic and reactive balance activities using unstable surfaces. In the late phases of rehabilitation, muscular power deficits were addressed through activities prioritizing quick explosive movements (jump squats, jump lunges, single/double leg hopping, etc). Manual therapy techniques were included early in the rehabilitation process to improve soft tissue extensibility and joint mobility. Manual therapy techniques consisted of soft

| Figure 1. Pitting Ede | ma Scale Used to Grade Peripheral |
|-----------------------|-----------------------------------|
| Edema for this Patien | t's Case <sup>12</sup>            |
|                       |                                   |
|                       |                                   |

| 0+ | • No pitting edema   |
|----|--|
| 1+ | <ul> <li>Mild pitting edema</li> <li>0-2 mm depression; &lt;10 seconds to rebound</li> </ul>       |
| 2+ | Moderate pitting edema     2-4 mm depression; 10-15 seconds to rebound                             |
| 3+ | Severe pitting edema     4-6 mm depression; 15-20 seconds to rebound                               |
| 4+ | <ul> <li>Very severe pitting edema</li> <li>6+ mm depression; &gt;30 seconds to rebound</li> </ul> |

tissue massage, mobilization with movement techniques, and joint mobilizations directed at the tibiofemoral and patellofemoral joint.

The patient received education regarding DVT diagnosis and management. He was educated on the importance of continued anticoagulant therapy throughout rehabilitation.<sup>4</sup> He was further educated on edema management techniques such as elevation, compression, and active exercise, and was instructed to wear compression stockings (at least 30 mmHg) regularly.<sup>4</sup>

### OUTCOME

At initial intake, the patient's Physical Functional Status Primary measure on the knee FOTO was 30 out of 100, corresponding to 70% limitation in function. At discharge, the FOTO score was 85 out of 100, which correlates to a 15% limitation in function. The patient's functional status measure increased 55 points over the plan of care, which was both a clinically measurable and significant improvement in function. The patient demonstrated adequate strength/ power in the right LE during the single leg hop test for distance. In this test, the patient jumps as far as possible on a single leg without losing balance and must land firmly. The goal is to have a less than 10% difference in hop distance between the injured limb and uninjured limb.1 The patient scored an average of 161.3 cm on his unaffected LE and 144.1 cm on his affected LE, which was a difference of 10.7%.

The patient had returned to participating in strength training at his gym 2x/week and also to his bowling league. He was able to run and jog with minimal discomfort for brief intervals but was limited secondary to cardiovascular fitness levels. Patient was not limited with walking, standing, driving, heavy housework, lifting, or squatting, and was able to return to his role as a spouse and father. He was also able to participate in coaching his children during basketball and softball practice, which required jogging, pivoting, and deep squatting. He continued to have discomfort with deep squatting and was unable to achieve full right knee flexion but was encouraged to continue his home exercise program independently. Patient did not return to softball at the time of discharge but was encouraged to participate while wearing his knee brace. Patient continued to have mild edema in the right calf/ankle and was instructed to continue using compression stockings to manage that and to prevent secondary complications from the DVT in his right LE. The patient was discharged to an independent home exercise program with his goals met.

### **DISCUSSION**

Physical therapists must assess patients for possible risk of LE DVT using the Wells' Criteria, specifically post operatively. Identify the likelihood of LE DVT when signs and symptoms are present, communicate with the patient's medical team and refer the patient to appropriate providers if a LE DVT is suspected. Determine appropriateness for participation in physical therapy, and manage or prevent further complications while rehabilitating the original injury/ surgery.<sup>4</sup> At the beginning of treatment, the patient was screened for risk factors related to possible VTE. The patient was noted to have 3 risk factors, which included obesity (BMI>30), prior history of varicose veins, and recent orthopaedic surgery requiring general anesthesia. As treatment progressed, patient had multiple venous thromboses, which increased his risk for future LE DVT. Additional pre-surgical assessment may include testing for clotting factor disorders, which have demonstrated association with DVT following orthopaedic procedures.

At 6 weeks post-op, the patient again presented with classic signs and symptoms of a LE DVT including pitting edema, and pain and tenderness in the posteromedial right knee. Using the algorithm for determining likelihood of a LE DVT established in the clinical practice guideline on the role of physical therapists in the management of individuals at risk for or diagnosed with venous thromboembolism (Figure 2).

After a diagnosis of LE DVT, the physical therapist must determine if the patient is appropriate for participating in physical therapy treatments. According to the clinical practice guideline, the physical therapist should verify whether the patient is taking an anticoagulant medication, what type of anticoagulant medication, and when the anticoagulant medication was initiated.11 A patient diagnosed with a LE DVT is at risk of developing a PE and mobility is contraindicated until intervention is initiated to reduce the chance of emboli traveling to the lungs.<sup>11</sup> The physical therapist in consultation with the medical team must determine when the patient has reached a therapeutic dose of anticoagulation medication and when/how much mobility can be initiated safely.

Once the patient had been deemed appropriate for physical therapy treatments, rehabilitation of the right knee arthroscopic ACLR with quadriceps tendon autograft and medial/lateral meniscectomy continued. Based on the clinical practice guideline, patient was encouraged to wear graduated compression stockings to prevent recurrent DVT/PE.4,12 Studies have shown that mechanical compression can lower the relative risk for progression of a thrombus and reduce the incidence of post-thrombotic syndrome.<sup>4</sup> Implementation of these DVT management techniques allowed for continuation of the rehabilitation without further complications.



### CONCLUSION

This case report highlights the physical therapist's role in identifying and managing patients at risk or diagnosed with a LE DVT in an outpatient physical therapy setting. In addition, it uses established clinical practice guidelines regarding the management of individuals at risk for or diagnosed with VTE to ensure appropriate treatment/ management. Proper management of individuals at risk for and/or diagnosed with VTE can decrease complications and improve patient outcomes.

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### ABSTRACT

Background: This case study demonstrates how motivational interviewing (MI) may be used in the physical therapy management of a patient with persistent neck pain. Case Description: The patient was a 57-year-old female with activity limitations of walking >1 mile and riding her stationary bicycle. Motivational interview-based patient education was provided, focused on supporting self-efficacy with symptom self-management and exercise. Outcomes: The patient was discharged after 3 in-person visits and 2 additional follow-ups via secure email over 12 weeks. The Fear Avoidance Belief Questionnaire score was reduced by 33% and numeric pain rating scale decreased from 5/10 to 0/10 at rest. In addition to her home program, the patient also reported performing regular aerobic exercise 3 to 4 times per week. Discussion: Improvements in activity avoidance beliefs and self-efficacy beliefs related to exercise appeared to be associated with improvement in disability. Clinical Relevance: Motivational interview is both clinically feasible and evidencebased to promote beneficial health behavior changes in a patient with persistent neck pain.

Key Words: neck pain, motivational interviewing, patient education, intervention

Motivational interviewing (MI) is a communication style that uses specific techniques and strategies as a goal to elicit and strengthen personal motivation for behavior change.<sup>1</sup> When used effectively, a healthcare practitioner can use MI to 'comfort the afflicted' and 'afflict the

comfortable,' balancing empathy with the need to build enough discrepancy to elicit change.<sup>2</sup> Through MI, practitioners create a non-confrontational and supportive climate with their patients. Ultimately, patients become comfortable expressing both positive and negative aspects of their current behavior.<sup>2</sup>

Unlike other counseling models such as Cognitive Behavioral Therapy or Cognitive Functional Therapy, the concepts of MI allow patients to do much of the psychological work to generate the rationale for change (**Table 1**).<sup>2</sup> Motivational interviewing begins with the assumption and honoring of patient autonomy – that people make their own behavioral choices, and that the power of choice cannot be appropriated by someone else.<sup>1</sup> Much of the art of eliciting change comes from a practitioner's ability to help patients detect possible contradictions in their thoughts and actions and experience the discrepancy between their current actions and who they ideally want to be.<sup>2</sup> Instead of attempting to convince or persuade patients to change, practitioners use subtle techniques to guide patients to contemplate and express individual reasons for and against behavior change and to understand how current behaviors may affect the ability to achieve functional goals. The OARS method is commonly used to put MI into action, consisting of open-ended questions, affirmations, reflection, and summaries (Table 2).

An accumulating body of research evidence supports the clinical use of MI, and MI is becoming more widely introduced

| Table 1. The Four Strategies of Motivational Interviewing and their Definitions <sup>6</sup> |  |  |
|--|--|--|
| Show Empathy   | Using reflective listening skills, in which one seeks to under-<br>stand the patient's perspective, thoughts, and feelings without<br>judgement, criticism, or blame.  |  |
| Develop Discrepancy/<br>Support  | Assist the patient in identifying differences between their cur-<br>rent behavior and their goals. This can be used to help 'tip the<br>balance' toward change.  |  |
| Deal with Resistance   | Approach resistance without judgement and understand<br>that the patient's perspective is not the same as the clinician's<br>(reflection, emphasizing choice, shifting focus of discussion,<br>reframing what was said). |  |
| Support Self-efficacy  | Highlight the patient's strengths and reflecting on when a patient has successfully changed.   |  |

| <b>Table 2.</b> The Four Strategies of the OARS Method and Their Definitions <sup>2,6,9,13</sup> |  |  |
|--|--|--|
| Open-Ended Questions   | Gather broad descriptive information to facilitate dialogue,<br>often start with words such as "how," "what," "tell me about,"<br>or "describe." |  |
| Affirmation  | Genuinely acknowledging and supporting the patient's<br>struggles and hard work; usually works best when focus is on<br>the patient.             |  |
| Reflections  | Showing interest in what the patient has to say and a desire to truly understand how that person sees things.                                    |  |
| Summaries  | Reinforcing what has been said to check that the clinician and<br>the patient are working on the same level.                                     |  |

in health professional curricula. Yet, the practice of MI in the clinical setting is currently not widespread. Alperstein and Sharpe<sup>3</sup> found that including MI as an adjunct to traditional physical therapy clinical treatment may have a positive effect on adherence to exercise, however, the evidence included in this study was medium to low in quality. Additionally, a randomized controlled trial by de Vries et al found that including MI in a patient-centered approach showed greater compliance in moderateintensity physical activity per day.<sup>4</sup> However, the intervention under study was a more generalized approach as opposed to a more focused utilization of the principles of MI. Nooijen et al found that MI combined with physical therapy interventions resulted in significantly greater duration of physical activity in people with subacute spinal cord injury.<sup>5</sup> A systematic review by O'Halloran et al indicated that MI may increase short-term adherence to interventions for people with chronic health conditions.6 While findings from these studies suggest that MI may have a positive effect on adherence to exercise, none of them examined the use of MI when treating a patient with an orthopaedic diagnosis. This case study presents how the principles of MI can be used to manage a patient with persistent pain in outpatient physical therapy.

### **CASE DESCRIPTION**

The patient was a 57-year-old female certified nursing assistant (CNA) referred by her primary care physician for cervical degenerative joint disease, bilateral lateral epicondylitis, and bilateral Achilles tendinitis. The patient's main concerns included a 3-year history of bilateral neck, shoulder, arm, mid back, low back, buttock, posterior thigh, and posterior calf pain. There was no specific mechanism of injury that preceded symptoms. The patient described her symptoms as 5/10 stiffness and achiness at rest and 10/10 at worst on the NPRS, with 0 representing no pain and 10 representing the worst pain imaginable. In addition, the patient reported a one-year history of poorly controlled migraine headaches.

Symptoms had worsened since initial onset and were worsened with all bodily movement. Symptoms particularly limited the patient from going on walks for greater than one mile, as well as other forms of aerobic and strengthening exercises. The patient reported minor relief with ibuprofen. Prior treatment included prescribed non-steroidal medications and chiropractic treatments, both of which had not improved her symptoms. The patient's goals included returning to walking more than one mile and riding her stationary bicycle.

### **Physical Examination**

The patient demonstrated full active cervical spine range of motion in all directions but reported pain in her right upper trapezius with left side bending and right rotation. There was full and pain free shoulder range of motion into flexion and abduction. Upper extremity myotomes, deep tendon reflexes, and dermatomes were intact. Finally, she demonstrated negative Hoffman's and inverted supinator tests.

Combined with the fact that no nociplastic pain mechanism was identified, the physical therapist inferred from the subjective examination that the patient developed an avoidance of general exercise. The Fear-Avoidance Beliefs Questionnaire (FABQ) was used to track changes over the patient's course of care. The FABQ objectifies how a patient's beliefs about physical activity and work may affect and contribute to their symptoms and resulting disability.<sup>4</sup> This outcome measure has 2 subsections: physical activity (FABQ-PA) and work (FABQ-W). It is scored on a 0-6 scale, with 0 indicating low fear-avoidance and 6 indicating high fearavoidance. The minimum score is 0 and the maximum score is 24 and 42 on FABQ-PA and FABQ-W, respectively. The cut-off score indicating elevated fear-avoidance beliefs is 13 and 29 for the FABQ-PA and FABQ-W, respectively. The minimally clinically important difference (MCID) for the FABQ when given to patients with back pain is 13 points.7 Internal consistency for both subsections are excellent (FABQ-PA: ICC=0.91; FABQ-W: ICC=0.83).7 Initial FABQ scores as well as FABQ scores at subsequent visits are listed in Table 3.

### **EVALUATION**

Given the patient's full active cervical spine and shoulder ranges of motion, ab-

sence of upper extremity myotomal weakness, and absence of findings warranting additional medical testing and treatment, the physical therapist reasoned that the patient's symptoms likely were due to fear-avoidance of physical activity. The patient demonstrated neck pain that limited her from going on walks greater than 1 mile and participating in aerobic and strengthening exercise. Further limitations in activity participation were related to expectations from immediate family, attitude toward physical activity, and work environment. The initial plan of care included initiation and graded exposure of aerobic exercise, mobility exercise, and strengthening exercise when appropriate.

Based on findings from the initial visit, the patient's prognosis was estimated to be fair due to the physical requirements of her job and her responsibilities to care for her aging father. These 2 factors led to increased emotional lability at visit 1, suggesting an emotional willingness to change. The factors of the patient's job, social situation, emotional state, and peripheral symptoms demonstrated a fair prognosis. Several other factors, however, raised the physical therapist's estimate of her prognosis. First, the patient demonstrated a good understanding of the positive effect exercise can have on one's mental and physical health, which was magnified when she was taught exercises that did not exacerbate her symptoms. Finally, the patient also had a very supportive husband. It is known that having just one person who provides practical or social support can impact one's disability and prognosis.7

### **CASE OUTCOMES**

### Visit 1

During the initial visit, principles of MI were used. The physical therapist displayed empathy by asking about the nature of the patient's symptoms, understanding the location of symptoms, main concerns, and related functional impairments and activity limitations. Open-ended questions were asked that demonstrated genuine

| Table 3. Fear-Avoidance Beliefs Questionnaire Scores at Each Visit                                      |                            |                         |                        |
|---|----------------------------|-------------------------|------------------------|
|   | FABQ Score<br>(maximum 96) | FABQ-PA<br>(maximum 24) | FABQ-W<br>(maximum 42) |
| Session 1   | 70                         | 20                      | 34                     |
| Session 2   | 59                         | 18                      | 31                     |
| Session 3   | 47                         | 15                      | 21                     |
| Abbreviations: FABQ, Fear-Avoidance Belief Questionnaire; FABQ-PA, Fear-Avoidance Belief Questionnaire- |                            |                         |                        |

Abbreviations: FABQ, Fear-Avoidance Belief Questionnaire; FABQ-PA, Fear-Avoidance Belief Questionnaire-Physical Activity; FABQ-W, Fear-Avoidance Belief Questionnaire-Work understanding toward the patient's socioenvironmental situation while avoiding asking questions in a "check-list" format. Affirmation and reflection were practiced during the subjective examination, in which the patient discussed their social demands. The therapist's posture was welcoming: his shoulders, knees, and feet were directly facing that of the patient's. The physical therapist also maintained an appropriate special distance from the patient and maintained eye contact during the majority of the subjective examination to demonstrate his undivided attention to her.

The patient described her physically demanding role as a CNA. Additionally, the patient described her responsibility of caring for her father and assisting him with activities of daily living, which led the patient to cry and express how difficult her overall situation was for her. The physical therapist responded empathically by gently placing his hand on the patient's shoulder and allowing a moment of silence before proceeding with the visit. After she outlined her social demands and briefly discussed her Filipino culture, the therapist affirmed the difficulty of juggling a full-time job and caretaking of her father. The physical therapist's acknowledgement of the cultural expectations contributing to the patient's social demands was confirmed through sharing of similar cultural background to that of the patient.

While mobility exercises were performed, the patient reported that her symptoms decreased from a 5/10 to a 3/10. While the initial home program was aimed at modulating the patient's symptoms, support was also given to provide ease of access to perform the patient's home program. During this session, various strategies were suggested for the patient to complete her home program while managing her social demands. Initially, the patient was resistant to performing regular exercise because of her social demands and perceived lack of time. In response, the patient was asked, if she could spare only 5 minutes every day to her home program. The patient was agreeable to the suggestion and offered to performing select exercises during her breaks at work. By providing the education on the physical benefits of exercise in modulating the patient's symptoms, she understood the value of changing her current activity levels.

### Visit 2

Visit 2 began with a 10-minute warm-up on the treadmill. As in visit 1, the physical therapist exhibited positive body posturing and non-verbal behavior to convey undivided attention to the patient. Exhibiting empathy when asking about the patient's daily routine, her work as a CNA, and details about caring for her father, the physical therapist expressed genuine curiosity through positive tone of voice and speaking cadence, to foster an open dialogue thus, minimizing the feeling of a formal interview. Additionally, the physical therapist responded with facial expressions appropriate to the conversation to further show his genuine curiosity. Openended questions such as "how has everything been since our last visit?" offered the patient confidence to report that her resting symptoms consistently decreased to 2/10. From further dialogue it was learned that the patient is the sole family member available and willing to help care for her father, and as the oldest of her siblings is culturally expected to do so. To validate her feelings and show empathy, the physical therapist expressed how frustrating and difficult the patient's situation must have been.

The patient's stress and difficulty in juggling her job as a CNA and taking care of her father were compassionately acknowledged. Additionally, the physical therapist complimented the patient for sharing her stories, despite her personal difficulties and showed support by commending the patient for being able to perform her exercises despite her busy schedule.

Upon reviewing the home program with the patient, her self-efficacy was supported by highlighting that performing her exercises tended to decrease her symptoms. The patient also acknowledged this observation by noting that her decrease in symptoms tend to last for 1-2 hours after performing her home program. Tactile cuing with exercise instruction was limited to promote greater self-efficacy with her exercises. The patient displayed resistance when asked what her plan was moving forward; she responded that she did not have a plan. The patient responded positively when the physical therapist offered to help develop a plan. The patient's autonomy was recognized working with the patient to provide a plan for how to progress her activity levels outside of physical therapy. Together, the patient and physical therapist agreed to increase her walking time by 5 minutes every week and the volume of her home program by 1 set every week.

### Visit 3

Like the second visit, the third visit started with an open-ended question of "how has everything been since our last visit?" The same strategies as visit 1 and 2 were employed to show empathy on visit 3. The patient reported that she had increased her walking time to 15 minutes per day and increased the number of sets of her exercises to 5 total. Her resting symptoms decreased to 0/10, and her overall affect and tone of voice suggested that she was pleased with her progress. The physical therapist's tone of voice, speaking cadence, and facial expressions appropriately matched the emotion evoked by the patient, helping to contribute to the supportive atmosphere. Overall, the patient performed her exercises consistently and reported that exercises helped to decrease her symptoms. The patient also reported that she started to perform additional exercises to increase her activity levels. At this time, the patient's husband had recently bought her an exercise equipment that allowed her to start resistance training. During the subjective examination, reflection was implemented, in which the physical therapist showed engagement in discussion with the patient. Interest was expressed in wanting to fully understand the patient's experience and situation.

During the visit, the patient expressed how performing regular exercise not only decreased her resting symptoms but also allowed her to feel more energized. Return to performing resistance exercises on her home exercise machine was added as a patient-stated goal. The physical therapist reinforced the patient's improved self-efficacy by explaining how gradual exercise helped the patient progress further toward her functional goals. The physical therapist then commended her for being able to see the positive effects of performing her exercises. The physical therapist practiced affirmation in acknowledging how much the patient had overcome over the course of her care. Summarization reinforcing the original physical therapy goal with updated exercises to progress the patient toward increasing her activity levels, strengthening her lower and upper extremities, and developing her cardiovascular fitness was then employed by the physical therapist.

At the last visit, the patient demonstrated clinically significant improvements between visits as well as by the end of treatment (Session 1: FABQ 70/96, session 3: FABQ 47/96), improving by 23 points – well above the MCID of 13 points.<sup>4</sup> While the patient was just above the cutoff score for the FABQ-PA by session 3 (FABQ-PA = 15), she was well below the cutoff score for the FABQ-W (FABQ-W = 21).<sup>4</sup> After the last clinic visit, the patient tested positive for novel coronavirus disease (ie, COVID-19)

and was unable to attend further physical therapy visits. After the patient recovered, she e-mailed the physical therapist that she was continuing to improve, and no longer needed to be seen as a patient for physical therapy.

### DISCUSSION

This case study demonstrates that MI principles can be easily integrated into the management of chronic pain in the physical therapy clinic. Motivational interviewing principles were utilized based on the patient's relevant contextual factors, activity limitations, self-perceived barriers, and physical therapy goals (Table 4). The specific therapeutic exercise interventions selected at each visit were prescribed based on the patient's change in symptoms from the previous session and ability to perform her prescribed home program. Motivational interviewing principles applied to the treatment of this patient were aimed at changing fear-avoidance beliefs, which were one of the largest barriers to being more active. Additionally, the MI principles were aimed at enabling the patient to exercise more often.

The clinical utility of MI in eliciting and strengthening motivation for change within the healthcare setting is supported by the literature.<sup>8-10</sup> However, as outlined previously, the use of MI in managing patients within the physical therapy setting is limited.3-6 This is surprising as more and more physical therapy programs are incorporating MI principles into their curriculum. The positive effects of using MI principles in the physical therapy setting has been documented, but the amount of research continues to be limited. Therefore, further research, especially interventional studies, should study the use of MI among patients with chronic pain in order to test the clinical utility of MI in this population. Additional research should also be performed on the use of MI to manage additional patient populations, including those with other musculoskeletal disorders.

### CONCLUSION

This case study highlights the use of MI principles in the management of a patient with chronic pain in outpatient physical therapy. After 3 in-person visits and 2 follow-ups via electronic messaging over 12 weeks, the patient's FABQ was reduced by one-third and her resting pain scale was reduced by 100%. Additionally, the patient reported performing regular aerobic exercise 3 to 4 times per week, a notable increase from her initial report of no exercise at all. Im-

**Table 4.** The Strategies of Motivational Interviewing That Were Used at Each Visit

|                       | Visit 1 | Visit 2 | Visit 3 |
|-----------------------|---------|---------|---------|
| Open-ended Questions  |         |         |         |
| Affirmation           |         |         |         |
| Reflections           |         |         |         |
| Summaries             |         |         |         |
| Show Empathy          |         |         |         |
| Develop Discrepancy   |         |         |         |
| Deal with Resistance  |         |         |         |
| Support Self-efficacy |         |         |         |

provements in activity avoidance beliefs and activity levels were associated with improvement in disability. Since the MI principles were performed throughout each session, little extra time was needed to use MI, demonstrating ease of integration into physical therapy practice. Therefore, this case study provides physical therapists with specific examples of how to successfully incorporate the principles of MI into their practice.

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### Physical Therapy Management of a Patient with Bilateral Knee Pain and Long COVID: A Case Report

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### ABSTRACT

Background: The purpose of this case study is to describe how post-exertional symptom exacerbation (PESE), a hallmark of long COVID, may affect the clinical course of physical therapy. Physical therapists can provide patient education and activity guidance to individuals with long COVID to improve clinical outcomes. Case Description: The patient was a 39-year-old female with a 20-year history of bilateral knee pain. Following severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, the patient developed PESE and increased bilateral knee joint effusion and pain, affecting her ability to perform cognitive tasks and walk, respectively. Outcomes: Following 8 weeks of intervention, the patient's Lower Extremity Functional Scale score improved from 35/80 to 59/80 and numeric pain rating scale decreased from 7/10 to 4/10 at maximum, but she experienced an apparent PESE relapse. Discussion: Post-exertional symptom exacerbation can affect multiple body systems, which may affect a patient's ability to participate in physical therapy. Clinical Relevance: Physical therapy management of individuals with long COVID must include monitoring during and after exertion for signs and symptoms of PESE.

**Key Words:** knee pain, post-COVID condition, evaluation, intervention, exertion

### **INTRODUCTION**

Since the emergence of the severe acute respiratory syndrome coronavirus 2 (SARS-COV-2), healthcare providers and researchers have been called upon to treat patients with the novel coronavirus disease 2019 (COVID-19) in all stages of the condition; from acute hospitalization to the persistent inability to return to valued life functions and roles. One-third to threequarters of people who were infected with SARS-COV-2 may continue to have at least one disabling symptom or sign 60 days or more after diagnosis, and the prevalence of long COVID 2 years after SARS-COV-2 diagnosis is approximately 20%.<sup>1-3</sup> These data suggest that long COVID is common and that people living with it experience prolonged episodic disability following SARS-COV-2 infection. Therefore, the effective clinical management of long COVID is now an important emerging competency for physical therapists.

Over 30 signs and symptoms have been associated with long COVID.4-6 Data from a recent phenotypic study of nonhospitalized patients suggest that symptoms experienced by half or more of a cohort with long COVID were disabling fatigue, cognitive dysfunction, sleep disturbances, dysautonomia, dizziness, and dyspnea.<sup>7</sup> These symptoms are often worsened after exertion, which is a phenomenon called postexertional symptom exacerbation (PESE).<sup>5</sup> The PESE is not unique to long COVID but appears as a clinical feature in fatigue-related conditions that commonly emerge following an illness. Long COVID has been compared to other post-viral disease states including myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS), of which has a wealth of research regarding post-exertional malaise (PEM) likely related to aerobic system impairments.8,9

Data from studies involving individuals living with PESE suggests a variety of impairments in oxidative metabolism, autonomic functioning, and immune responses that may underlie the multiple and severe signs and symptoms of PESE.<sup>10</sup> Specific to physical therapy, oxidative metabolism, orthostatic responses, and chronotropic responses are typically abnormal in deconditioned people.11,12 Therefore, patients with PESE should not be expected to demonstrate normal exercise training responses in terms of recovery time, blood pressure, and heart rate. In addition, fear-avoidance is not associated with the

degree of physiological impairment in people living with PESE, indicating that graded exposure to exercise is inappropriate for this population.<sup>13</sup> These observations suggest that an energy system first aid approach may be most appropriate for patients living with long COVID, consisting of pacing and other interventions to support circulation and metabolism based on symptom acuity.<sup>14</sup> Restorative movements as tolerated by the patient should only be introduced after a patient's functional baseline is carefully determined, so the movements may be titrated slowly and only to the extent they do not cause or exacerbate PESE.

As individuals living with long COVID work toward returning to their prior level of function, prior injuries and physical impairments may become problematic leading individuals to seek physical therapy to build endurance and activity tolerance. The purpose of this case report was to document the recovery of an individual with bilateral knee pain with movement coordination deficits and comorbid long COVID. This case report highlights clinical knowledge and skills that physical therapists can use to educate and support patients living with long COVID.

### **CASE DESCRIPTION**

The patient was a 39-year-old female referred to outpatient physical therapy for recurrent bilateral knee pain. The patient was a retired professional ballet dancer with an orthopaedic history of numerous knee injuries, most notably bilateral anterior cruciate ligament tears and right meniscus tear, each managed non-surgically, and a right patellar dislocation.

### **Patient History**

The patient's left knee pain was more severe than the right, the pain was located deep to the patella, and there was an associated instability of the knee joint. The patient's right knee pain was located diffusely in the anterior knee and on occasion there was an audible pop followed by swelling and weakness in the right quadriceps. The patient started experiencing worsening symptoms



and decreased endurance following suspected COVID-19 illness in January 2020. The patient had recently returned from international travel and she did not have access to a COVID test at the onset of her symptoms. The patient reported increased swelling in knee and wrist joints for 10 months following the exposure. Along with her knee signs and symptoms, the patient experienced recurrent week-long bouts of fever, fatigue, and cognitive dysfunction (limited short-term attention and memory) like her reported symptoms of initial COVID-19 illness. There was, however, a period of 7 months when the patient did not experience significant exacerbation of long COVID symptoms other than her baseline cognitive dysfunction and impaired endurance.

At the time of evaluation, the patient was limited to walking ½ block due to left knee pain. Patient's symptoms were partially relieved by wearing a left knee brace, applying ice, taking Motrin, and exercising on an elliptical machine. The symptoms were worse with standing and walking activities and worse at the end of the day. The patient's prior level of function included rock climbing, skateboarding, lifting weights, and dancing. Her past medical history included anxiety, depression, migraine, cesareansection, and cholecystectomy. Personal goals for physical therapy noted by the patient were to improve walking comfort and to return to lifting weights and rock climbing.

The patient completed a self-administered Lower Extremity Functional Scale (LEFS), Patient Specific Functional Scale (PSFS), and Numeric Pain Rating Scale (NPRS). The patient scored 35/80 on LEFS (the lower the score the greater the disability) and she scored 20/30 on PSFS for "work out," "walk quickly," and "stairs" ("0" represents "unable to perform" and "10" represents "able to perform at prior level"). She rated her symptoms at 2/10 best pain, 5/10 current pain, and 7/10 worst pain on NPRS.

### **Physical Examination**

During observational gait analysis, the patient demonstrated decreased stride lengths bilaterally and left knee hyperextension during left midstance with reproduction of pain. The patient demonstrated full and pain-free right knee, right ankle, and left ankle active range of motion. Patient's right active knee extension lacked  $5^{\circ}$  to the zero position passively and  $10^{\circ}$  to the zero position passively. Deep anterior knee flexion to  $117^{\circ}$  and to  $120^{\circ}$  passively. The patient demonstrated hesitation and muscle guarding during left knee extension testing, and her active knee extension measured  $3^{\circ}$  of

hyperextension; the patient did not consent to passive left knee extension testing due to pain and apprehension. Ligamentous and meniscal tests were not performed on the left knee due to the patient's high level of pain and apprehension in the left knee. The patient presented with negative anterior drawer test and positive McMurray test with reproduction of clicking and pain in the right knee. Upon palpation, the patient presented with increased effusion along the medial and lateral tibiofemoral joint lines bilaterally.

### **EVALUATION**

Based on the clinical examination, it was determined that the disablement for which the patient was referred for physical therapy best matched the presentation for chronic knee pain with movement coordination impairments. In addition, the physical therapist suspected that the patient was living with long COVID with corresponding PESE due to her self-reported history of cyclical increases of knee joint inflammation, cognitive dysfunction, and concomitant flu-like symptoms of fever and fatigue that worsened with increased activity.

#### **INTERVENTIONS**

The patient was seen for 9 visits over 12 weeks. On the initial visit, the patient received gait training to improve left stance



and patient education on her condition. The patient was then instructed on an exercise program for improving left quadriceps and hamstring co-contraction during standing, walking, and partial wall squat. During the first 3 sessions, she was instructed to walk without left knee hyperextension and she was educated about the value of consistent practice to improve coordination of her left lower extremity. As the patient demonstrated consistent performance of adequate stability during left stance activities, she was instructed to perform more challenging single leg activities including posterior sliders and single leg Romanian deadlifts. Planks and side planks were also added to the patient's home exercise program during the second visit. A rest in between each set of exercise for at least 60 seconds was strongly recommended and the patient was advised to perform her home exercise program no more than 3 times per week to allow for monitoring of PESE.

Throughout the exercise prescription process, the patient was educated on PESE, an abnormal response to exertional activity that occurs most often 12-48 hours after the activity lasting up to a few weeks with wide variability.<sup>5,13</sup> Immediate, short-term, and long-term symptoms of PESE were outlined to the patient: breathlessness immediately after exertional activity, increased pain in muscles and joints and brain fog in the short-term (2-4 days), and weakness, decreased function, and flu-like symptoms in the long-term (7+ days).<sup>11</sup> Patient-specific physical and cognitive triggers were discussed including walking one block and performing work-related activities. It was recommended to the patient to consider other potential triggers throughout her daily life and to make note of her symptoms following the exertional activity. If PESE was to occur following physical therapy interventions or the home exercise program, the patient was recommended to rest and to refrain from exercise and other exertional activities until her symptoms returned to baseline. The patient demonstrated a good understanding of exertional activity and voiced frustrations with her current physical and cognitive limitations.

During the fourth visit, the patient was asked to perform left single leg heel raises to fatigue and she was only able to perform 6 heel raises. The patient was educated on PESE versus post-exercise soreness and was instructed to add single leg heel raises to her home exercise program at a frequency of every other day if PESE did not occur.

During the last 2 visits, the patient reported acute onset of severe gastrointestinal discomfort, high fever, increased swelling in her knees, wrists, and fingers, and vomiting lasting a period of 36 hours. The patient ultimately went to the emergency room and tested negative for food poisoning and abdominal imaging performed at the hospital found unknown inflammation. The patient received a referral to see a gastroenterologist, and the patient was scheduled for a colonoscopy and an endoscopy. During this bout of gastrointestinal distress, the patient reported worsening energy levels and an inability to perform her home exercise program. Patient

education on PESE was reinforced and the patient was educated on Energy Envelope Theory, which is a theory designed to help patients with ME/CFS keep track of whether their cumulative daily activities will fit into their daily energy capacity/envelope or will exceed their daily energy capacity/envelope and result in a setback or relapse.<sup>15</sup> The patient demonstrated increased awareness of how her energy envelope had decreased in capacity due to the recent illness and how that required her to decrease her daily activities accordingly to avoid PESE.

In addition to PESE and Energy Envelope Theory, patient education during the final 2 visits before self-discharge included heart rate monitoring using the patient's smart watch. To identify relevant heart rate data, the patient was instructed to review her data after an exertional episode that resulted in PESE and identify the maximal heart rate to enable setting an alert on her smart watch notifying her when she is approaching her exertional limit. It is recommended for individuals living with PESE to limit the amount of time participating in activities that may require prolonged activation of a dysfunctional aerobic energy system.<sup>16</sup> This ventilatory anaerobic threshold (VAT) is best identified during maximal cardiopulmonary exercise testing.<sup>13</sup> In the absence of maximal cardiopulmonary exercise testing, contemporary expert opinion suggests that individuals with PESE should perform exertional activities within 15 bpm above resting heart rate.<sup>17</sup> This calculation to conservatively stay below the VAT is consistent within heart rate zone 1 or below 55-60% of maximal heart rate.18

### **OUTCOMES**

The patient repeated each of the outcome measures on the seventh visit during a reevaluation. The patient's LEFS improved by 24 points and exceeded the minimally clinically important difference (MCID) of 9 points.<sup>19</sup> The PSFS worsened by 3 points for "work out," "walk quickly," and "stairs." The NPRS improved from 2/10 best pain, 5/10 current pain, and 7/10 worst pain to 0/10 best and current pain and 4/10 worst pain, which exceeded the MCID for chronic musculoskeletal pain of 1 point.<sup>20</sup> The patient reported the ability to walk her dogs 0.5 mile without pain and to work out with her personal trainer 2 times per week. The patient also reported that although she had greatly improved her ability to pace physical activity with rest, she still had difficulty with pacing cognitive activities on a weekly basis.

### DISCUSSION

Approximately 20% of individuals aged 18-64 and one-quarter of individuals aged 65 and over who have been infected by SARS-CoV-2 risk the development of long COVID.13 These individuals may encounter a wide range of symptoms that include multiple body systems.<sup>5</sup> Many individuals will seek physical therapy to improve their activity tolerance and return to work and physical activity. As patients initiate physical therapy, it is the role of physical therapists to screen for PESE and educate patients on the deleterious effects of PESE. The DePaul Symptom Questionnaire, a 5-item patient questionnaire specific to post-exertional malaise (analogous to PESE), has been validated in individuals with ME/CFS and can be used to screen for PESE.13 This tool can help clinicians identify patients who will require close monitoring of symptom exacerbation during and following physical therapy interventions and activities of daily living. As with this case report, people may present to physical therapy 'with long COVID' rather than 'for long COVID.' Screening for PESE is important because it may affect the range of interventions physical therapists choose to best avoid harms and promote beneficence.

As progressive/graded exercise therapy is not recommended for individuals living with PESE, heart rate monitoring may be an effective tool to monitor moment-to-moment activity intensities for these individuals.<sup>13,21,22</sup> For individuals who have not undergone cardiopulmonary exercise testing, patients can use a simple calculation to estimate their VAT. Ventilatory anaerobic threshold may be a crucial threshold value to identify for individuals with PESE, particularly those with primary physical triggers, because of observed chronotropic intolerance; a blunted rise in heart rate that appears to be closely related to autonomic dysregulation.<sup>16</sup> Exercising above VAT may put the patient at risk for significant worsening of exercise tolerance. The anaerobic threshold can be estimated by adding 15 beats per minute to a patient's average resting heart rate. In this case study, the patient was educated to avoid exceeding VAT with both her daily activities and her home exercise program and to rest if she was symptomatic or exceeding her VAT.

The patient in this case report presented with 2 notable episodes of disability related to long COVID and PESE that lasted for over 6 months, with a period of 6 months of remission in between. Prior to physical therapy, the patient's primary orthopaedic complaints of left knee instability, bilateral knee pain, and impaired gait improved during the period of 6 months of remission of primary long COVID symptoms. When the patient's long COVID symptoms returned, the orthopaedic symptoms simultaneously returned. In addition to the primary orthopaedic and primary long COVID symptoms, the sudden gastrointestinal symptoms with fever led to an abdominal scan revealing unknown inflammation. In a recent cohort study of individuals with long COVID, more than 85% of participants reported musculoskeletal, cardiovascular, gastrointestinal, pulmonary, and neuropsychiatric symptoms. Many experienced multisystem symptoms for over 7 months.5 When working with individuals with episodic disability due to long COVID in the outpatient rehabilitation setting, it is crucial to monitor primary and secondary symptoms and educate patients about the episodic nature of long COVID and how long COVID can impact multiple body systems. Due to the wide variability of clinical manifestations of long COVID, it is also important to obtain a detailed subjective examination to track progress and to validate the patient's experience, thus strengthening the therapeutic alliance between the patient and the therapist.23

### **CONCLUSION**

Long COVID is a recent condition that resembles those previously studied, such as ME/CFS. While additional research is needed regarding patho-etiology and curative interventions, physical therapists can help patients initiate favorable health behavior changes that can conserve energy and promote symptomatic and functional stabilization. Many individuals may present 'with long COVID' rather than 'for long COVID,' heightening the importance of the physical therapist's role in assessing for PESE. This case emphasizes that physical therapists may provide patient education on energy system first aid/energy conservation to the growing population of individuals with episodic disability due to long COVID and other (commonly) post-viral conditions.

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### ABSTRACT

Background: Clinical practice guidelines (CPG) are helpful in improving patient care by translating current research into clinical recommendations to assist in clinical decision making. The purpose of this case report is to clinically apply the recommendations from the Academy of Orthopaedic Physical Therapy's Ankle Stability and Movement Coordination Impairments: Lateral Ankle Sprains (LAS) Revision 2021 CPG.8 Case Description: A 34-year-old man was referred to physical therapy with a 16-year history of recurrent left ankle sprains and a diagnosis of chronic ankle instability (CAI). Chronic ankle stability is a condition characterized by ongoing ankle instability. The patient had decreased ankle dorsiflexion range of motion, lower quarter weakness, balance limitations, and pain. Outcome: In 6 sessions distributed over 8 weeks, the patient demonstrated clinically important improvements in ankle dorsiflexion, balance, lower quarter weakness without an appreciable change in ligamentous laxity and self-reported CAI. He returned to desired activities without recurrent sprains. Discussion: The rehabilitation program was informed by the LAS CPG. Interventions emphasized a home exercise program to address proprioceptive, strength, and mobility deficits. Clinical Relevance: This case report demonstrates the application of CPG recommendations used to inform patient-centered care.

**Key Words:** ankle sprains, evaluation, intervention, evidence-based practice

### INTRODUCTION

A sprain is an injury to a ligament, most commonly occurring due to a quick

forceful movement causing an overloading of the tissue.<sup>1</sup> The prevalence of lateral ankle sprains (LAS) is 11% for both sexes,<sup>2</sup> placing it as the most frequent sprain. Females have nearly doubled the incidence of ankle sprains when compared to males.<sup>2</sup> Almost 60% of LAS occur in people aged 18-49 years.3 While they are often associated with sports injury, the majority of LAS do not occur during athletic activities.<sup>4</sup> A combined movement of forced plantarflexion and inversion most often involves the anterior talofibular ligament (ATFL).<sup>5</sup> Other commonly involved ligaments in a LAS are the calcaneofibular and posterior talofibular ligaments.<sup>5</sup> During an inversion sprain, the lateral ankle is stretched and loaded while the medial ankle is compressed. If compressive loading is sufficient, the impact between the distal tibia and talus can result in anteromedial ankle impingement.<sup>6,7</sup>

After sustaining a lateral ankle sprain, the individual will either return to near previous level of function within 1 year of the original incident, or they will report longstanding instability.8 Chronic ankle instability affects up to 40% of individuals after sustaining a first-time ankle sprain.9 People with CAI report recurrent instances of the ankle either giving way or feeling as if it will give way. This instability is mechanical, neuromotor, a combination of mechanical and neuromotor, or subjective. Mechanical instability is a result of structural changes that prevent the ankle from controlling movement. Neuromotor instability is a result of a discontinuity within the proprioceptive system that prevents the ankle from controlling movement. Subjective instability is characterized by feeling that the ankle is unstable without the ankle giving way. In addition to ankle deficits, individuals often demonstrate mobility, proprioceptive, and/or neuromuscular issues in the knee, hip, and trunk.8 Up to 31% of patients continue to have a positive anterior drawer test 6 months post-injury, and up to 42% report feelings of instability one year after a LAS.<sup>10</sup>

The Academy of Orthopaedic Physical Therapy (AOPT) of the American Physical

Therapy Association has sponsored 2 versions of clinical practice guidelines to synthesize and distribute recommendations for clinical care of individuals who have experienced LAS and CAI.<sup>8,11</sup> The recommendations are framed within the terminology of the World Health Organization pertaining to body function/structure impairments, activity limitations, and participation restrictions. The most recent release, Ankle Stability and Movement Coordination Impairments: Lateral Ankle Ligament Sprains Revision 20218 covers prevention, diagnosis, examination, and interventions for the assessment and treatment of individuals with LAS and CAI.8 Clinical practice guidelines for LAS and CAI serve as a safe, evidenced-based starting point and are not meant to replace individualized, patient-centered care. However, clinical application of recommendations from this CPG have not yet been documented in the literature. The purpose of this case report is to describe application of AOPT's Ankle Stability and Movement Coordination Impairments: Lateral Ankle Ligament Sprains Revision 20218 to the physical therapy management of CAI.

### **CASE DESCRIPTION**

The patient was a 34-year-old air marshal with a 16-year history of left CAI that originated with a left ankle sprain sustained during military service in Iraq. He reported up to 8 recurrent inversion sprains per year with walking over uneven terrain. The patient's most recent sprain occurred 2 weeks prior to the evaluation.

### **EXAMINATION**

#### **Cumberland Ankle Instability Tool**

The Cumberland Ankle Instability Tool (CAIT) is a reliable and valid outcome measure used to identify CAI.<sup>12</sup> The tool is a 9-item questionnaire that assesses an individual's feelings of ankle instability. The CAIT has a maximum score of 30 and the CAI cutoff score for instability is < 25/30. The patient scored 9/30 for the affected left ankle and a 30/30 for the unaffected right ankle at the time of examination.

### Numerical Pain Rating Scale

The Numerical Pain Rating Scale (NPRS) is an outcome measure used to assess the subjective intensity of an individual's pain. The NPRS is a numeric interpretation of the visual analog scale (VAS) that has been shown to have excellent concurrent validity with the VAS.<sup>13</sup> At the time of the examination, the patient reported a pain range from 0/10 to 7/10 when performing aggravating activities in weight bearing.

### Foot Posture Index

The Foot Posture Index (FPI) is a clinical tool to assess resting foot position with the individual standing in a relaxed double stance position. The tool was developed in 2005 and uses 6 components each scored on a 5-point scale ranging from -2 to +2 to determine if the foot under examination is resting in a supinated (more negative) or pronated (more positive) position.<sup>14</sup> A normative value study for the FPI reported the average resting foot position to be somewhat pronated (+4) with a standard deviation of 3.15 According to the FPI, pathological foot postures would be scored less than -3 or more than +10.15 At examination, the patient's score for the unaffected right foot was +2 while the affected left foot was +5.

#### **Observation & Palpation**

Standing observation of the patient revealed level hips with a neutral pelvis, good muscle definition of the quadriceps, hamstrings, and calf musculature with no noticeable atrophy, and a valgus resting position of the left hindfoot. The patient ambulated with normal gait mechanics with eyes open and with a decreased stride length and overall gait speed with eyes closed. Squat analysis was unremarkable; the patient was able to squat to a full depth without pain. Single leg squat observation revealed side-to-side differences between the unaffected and affected side: pain limited depth of squat on the affected left side when compared to the unaffected right side. Palpation of the left distal tibia and deltoid ligament, especially at the anterior tibiotalar ligament insertion, were tender and reproduced the patient's familiar pain.

### Ankle Mobility & Strength

Mobility measurements were grossly within functional limits and symmetrical bilaterally except in calcaneal eversion, which was limited bilaterally, and dorsiflexion on the left side (**Table 1**). The right ankle had 20° of passive dorsiflexion motion with a flexed knee while measured in prone. The left ankle had 10° of passive dorsiflexion motion with a flexed knee while measured in prone. The measurements were taken with the stationary arm aligned with the midline of the lateral calf and the moving arm aligned with the plantar heel fat pad as described by Norkin & White.<sup>16</sup>

Strength assessment encompassed both manual muscle testing (MMT) and single leg heel raise performance testing. Manual muscle testing of the ankle included the posterior tibialis (right 4+/5, left 4/5), peroneal muscles (right 4/5 with longus breaking first, left 4-/5 with brevis breaking first), extensor hallucis longus (right 5/5, left 4/5), and tibialis anterior (right 5/5, left 5/5). Hip muscle performance also was measured, including hip flexors (right 5/5 left 5/5) hip external rotators (right 5/5, left 5/5), hip abductors (right 5/5, left 5/5), and hip extensors (right 4+/5, left 4+/5). Manual muscle testing assessment was performed as described by Kendall.<sup>17</sup>

Calf muscle performance was determined by the number of single leg heel raises the

patient could perform with full range of motion, a modification of the method described by Lunsford and Perry.<sup>18</sup> Testing was performed with fingertips at a wall and the patient was given the instruction to perform single leg heel raises with 1 second concentric and 1 second eccentric phases. The test was stopped when the patient either chose to discontinue, the therapist asked the patient to stop due to inability to go through full range of motion or maintain tempo, or if the patient reached 20 repetitions. At the evaluation, the patient was able to perform 20 heel raises on the unaffected right side and 7 heel raises on the affected left side due to pain.

### **Special Tests**

Structural integrity of the ATFL was assessed by palpation of the ligament while performing the reverse anterolateral drawer test (RADT).<sup>19</sup> The RADT was performed with the patient seated with the hip and knee in flexion and the foot placed on the plinth in 10-15° of plantarflexion, while palpating the ATFL and stabilizing the foot, a posterior directed force was placed on the distal tibia. Ligamentous laxity was determined subjectively by the therapist by using the unaffected side for comparison. There was minimal laxity in the left ATFL compared to the right and no pain was elicited during the test. Neither laxity nor pain were noted with the Kleiger's test and talar tilt tests as described by Lynch.20

### **Functional Tests**

Single leg balance was assessed with the patient barefoot and hands resting by his sides. A modification of the procedure described by Trojian and McKeag.<sup>21</sup> The patient was instructed to bend the non-stance knee and maintain the position for 30 seconds and was given one trial per leg. The patient

| Table 1. Relevant Impairments, Matched Interventions, and Dosage |  |  |
|--|--|--|
| Body Structure/<br>Function Impairment                           | Intervention   | Dosage   |
| Ankle Mobility   | Static gastrocnemius and soleus stretching<br>Cross body lunge   | 3 repetitions 30 seconds holds once daily<br>3 sets of 12 repetitions once daily   |
| Proprioception   | Single leg balance progression; EO FS -> EO US -> EC FS<br>Y-balance   | 3 repetitions 30 seconds holds once daily<br>3 sets of 12 repetitions once daily   |
| Weakness   | Heel raise progression; BL -> SL Sup ->SL No Sup<br>Hopping progression; DL Fwd, Bkwd, Lat, Rot to SL Fwd,<br>Bkwd, Lat, Rot | 3 sets of 20 repetitions once daily<br>3 sets of 10 repetitions 3-5 times per week |
|  |  |  |

Abbreviations: EO, eyes open; FS, firm surface; US, unstable surface; EC, eyes closed; BL, bilateral; SL Sup, single leg with support; SL No Sup, single leg without support; DL, double leg; Fwd, forward; Bkwd, backward; Lat, lateral; Rot, rotation

was able to balance for 30 seconds on each leg without stepping or having any gross instances of losses of balance. Comparison of the two sides showed increased ankle muscle activation and overall postural sway on the left leg. The patient also reported increased familiar medial ankle pain when balancing on the left leg.

The Y-balance test was administered with the patient barefoot.<sup>22,23</sup> The patient was instructed to stand on one leg while reaching forward with the contralateral leg to a maximal distance where the patient could hover the extended lower extremity momentarily over the floor and return to standing without losing his balance. Testing consisted of one warm-up trial and one measured trial. Reaching distances were in the anterior, posteromedial, and posterolateral directions. Reach distances for the anterior direction were standing on right foot 62cm and standing on the left foot 52cm, posteromedial reaches standing on the right foot 81.5cm and left foot 63cm, and the posterolateral reaches on the right foot 87cm and the left foot 75cm.

### **EVALUATION**

Upon completion of the objective examination, a clinical diagnosis of left CAI was established in accordance with recommendations from the LAS CPG. There were ankle mobility deficits in dorsiflexion and eversion, weakness in the posterior tibialis, peroneus brevis, and extensor hallucis longus, no significant laxity of either the anterior talofibular or deltoid ligaments, and proprioceptive and balance deficits of his left ankle. The patient's reported instability was determined to be neuromotor due to the lack of mechanical instability and presence of proprioceptive asymmetries.

### **INTERVENTIONS**

The course of treatment focused on addressing the patient's neuromuscular deficits. Interventions were chosen to improve proprioception, weakness, balance, and pain modulation. A combined treatment approach as recommended by the CPG<sup>8</sup> consisting of therapeutic exercise and manual therapy was implemented to help the patient return to his prior level of function (**Table 1**).

The patient was educated on clinical examination findings, diagnosis, and the expected rehabilitation process. The patient was then instructed in and demonstrated a home exercise program designed to improve ankle mobility, proprioception, and strength to address noted deficits and reduce the likelihood of future ankle sprains.

#### Ankle mobility

The patient was instructed in daily static stretches to improve both the length of the gastrocnemius and soleus muscles. The exercises were performed at a wall with the forefoot on the wall with the heel remaining on the ground, and the patient was instructed to lean forward with the knee either extended (gastrocnemius bias) or knee bent (soleus bias) until he felt a comfortable stretch. The stretches were performed daily, held for 30 seconds, and each were repeated 3 times.

To improve ankle eversion, the patient was prescribed cross over lunges where his front foot was kept planted on the ground and the back foot moved behind the stance leg bringing the planted foot into an everted position. Exercise dosage consisted of three sets of twelve repetitions on each leg daily.

### Proprioception

To address the proprioceptive deficits, the patient performed both static and dynamic exercises. He performed a barefoot static single leg balance progression. The first stage was single limb stance on a solid surface with eyes open. Once the patient was able to perform 30 seconds without error, he was placed on a foam pad with eyes open. Upon demonstrating 30 seconds of single limb stance on the foam pad, the patient progressed to performing single leg balance on a firm surface with eyes closed.

The first dynamic proprioceptive exercise targeted the side-to-side discrepancy identified during the Y-balance test. Like the single leg balance progression, the test became the intervention. As part of the home exercise plan, the patient was instructed to balance on one foot while lowering the body to reach in the anterior, posteromedial, and posterolateral directions with the contralateral leg and returning to standing without losing balance or dynamic control of the stance leg. The patient was instructed to perform 3 sets of 12 repetitions once per day.

#### Strength

At the evaluation, the patient demonstrated weakness in tibialis posterior as well as the peroneals musculature. To address these clinical findings, the patient was prescribed a heel raise progression program beginning with bilateral heel raises. The patient was instructed to perform 3sets of 20 repetitions daily until he was able to perform them with minimal discomfort. The patient was then progressed to performing single leg heel raises near a wall for balance if needed, 3 sets of 15 repetitions were prescribed because the patient was able to perform a maximum of 17 single leg heel raises. The final progression was performing single leg heel raises with no support for 3 sets of 20 repetitions performed 3-5 days per week as tolerated. All heel raises were performed to a cadence of 1 second each for raising and lowering.

The patient in this report was an active runner and was unable to perform this activity due to pain on evaluation. When discomfort decreased at the third visit, 3 weeks after the initial session, a plyometric program was initiated to simulate the single leg demands of running. The patient demonstrated the ability to perform 10 double leg jumps in place, forward and backwards, side to side, and with 90° rotations without impairments. The exercise program was then progressed to performing single leg hops in these patterns. The patient reported increased discomfort with stationery and rotation hops and was therefore prescribed 3 sets of 10 repetitions of the forward and lateral single leg hops 3-5 days/week as tolerated.

### **OUTCOMES**

The patient was seen in person 5 times over an 8-week period (Table 2). Over those 8 weeks the patient met his stated goals of reducing his ankle pain to 1/10 on the NPRS, improving ankle stability, and returning to his previous workout routine, including running, without restrictions. At the final visit, the patient's CAIT scores were unchanged: 9/30 for the left and 30/30 for the right, which did not meet the minimum clinically important difference (MCID) of 3 points.<sup>24</sup> Yet, by the fourth visit, the patient reported full return to his previous workout routine with some pain that did not limit his ability to perform any exercise. The patient had 20° of ankle dorsiflexion motion bilaterally by the third visit. At the fourth visit, MMT results were tibialis posterior (right 4+/5, left 4+/5), peroneal muscles (right 4/5, left 4/5), and tibialis anterior (right 5/5, left 5/5). The patient demonstrated Y-balance excursion testing improvements greater than the MCID of 7.7 cm.<sup>22</sup> The patient's single leg balance improved on the affected left side to 30 seconds with eyes closed barefoot on a firm surface with minimal sway without pain at discharge.

### DISCUSSION

During the initial assessment, the CPG recommends using outcome measures such

**Table 2.** Clinical Measures at Initial Evaluation and Final Measurement for the PatientTreated in This Case Report<sup>a</sup>

| Initial Measurement   | Final Measurement                          |  |  |
|---|--|--|--|
| Cumberland Ankle Instability Tool   |  |  |  |
| Right: 30/30  | Right: 30/30                               |  |  |
| Left: 9/30  | Left: 9/30                                 |  |  |
| Numerical Pai   | n Rating Scale                             |  |  |
| Range: 0-7/10   | Range: 0-3/10                              |  |  |
| Ankle N   | /<br>Mobility                              |  |  |
| Right Dorsiflexion: 20 degrees  | Right Dorsiflexion: 20 degrees             |  |  |
| Left Dorsiflexion: 10 degrees   | Left Dorsiflexion: 10 degrees              |  |  |
| Single Leg  | Heel Raise                                 |  |  |
| Right: 20 without pain  | Right: 20 without pain                     |  |  |
| Left: 7 with pain   | Left: 20 without pain                      |  |  |
| Manual Mu   | iscle Testing                              |  |  |
| Right Posterior Tibialis: 4+/5  | Right Posterior Tibialis: 4+/5             |  |  |
| Left Posterior Tibialis: 4/5  | Left Posterior Tibialis: 4+/5              |  |  |
| Right Fibularis Complex: 4/5  | Right Fibularis Complex: 4/5               |  |  |
| Left Fibularis Complex: 4-/5  | Left Fibularis Complex: 4/5                |  |  |
| Right Tibialis Anterior: 5/5  | Right Tibialis Anterior: 5/5               |  |  |
| Left Tibialis Anterior: 5/5   | Left Tibialis Anterior: 5/5                |  |  |
| Y-Balance Exc   | ursion Testing                             |  |  |
| Anterior: 10.0 cm   | Anterior: 2.5 cm                           |  |  |
| Posteromedial: 18.5 cm  | Posteromedial: 1.5 cm                      |  |  |
| Posterolateral: 12.0 cm   | Posterolateral: 0.5 cm                     |  |  |
| Single Leg Balance  |  |  |  |
| Right: 30 seconds firm surface eyes open  | Right: 30 seconds firm surface eyes closed |  |  |
| minimal sway without pain   | minimal sway no pain                       |  |  |
| Left: 30 seconds firm surface eyes open   | Left: 30 seconds firm surface eyes closed  |  |  |
| moderate sway with pain   | minimal sway no pain                       |  |  |
| Final measurements may have taken place on visits that were not the final visit in the episode of care. |  |  |  |

as the CAIT, a discriminative tool, to identify the presence of CAI (Table 3). The patient's CAIT scores ranging from 9-11/30 on the affected ankle are indicative of CAI.12 The patient also reported a history of multiple ankle sprains over a 16-year period. The CAIT is most appropriate to administer with individuals who report a history of repeated ankle sprains via similar mechanisms. The CAIT scores of this patient were not a major influence in the author's clinical decision making initially because he had recently experienced an acute lateral ankle sprain. The patient's disablement was first treated as an acute ankle sprain before transitioning to focus on his chronic instability.<sup>25</sup> The CPG also recommends using other outcome measures, such as the Foot and Ankle Ability Measure and Lower Extremity Functional Scale, that are validated to track longitudinal progress over the course of rehabilitation (**Table 3**). In this case, the patient's subjective reports were used to track disability. The Patient Specific Functional Scale (PSFS) may have been a good choice for this case, because he had specific functional goals. However, the PSFS was not included in the CPG. Additional research to validate the PSFS in this population appears warranted.

Interventions were prioritized based on the patient's presentation and CPG level of evidence (**Figure 1**). A home exercise program (HEP) was the primary mechanism for improving deficits identified at **Table 3.** Inclusion of Clinical PracticeGuideline Recommendations in the Pa-tient's Examination, Diagnosis and Classification, and Plan of Care

| Diagnosis and Classification       |     |  |
|------------------------------------|-----|--|
| Cumberland Ankle Instability Tool  | Yes |  |
| Identification of Functional Ankle | No  |  |
| Instability                        |     |  |
| Examination                        |     |  |
| Outcome Measures                   |     |  |
| Patient-Reported Outcomes          | No  |  |
| Measurement Information sys-       |     |  |
| tem physical function and pain     |     |  |
| interference scales                |     |  |
| Foot and Ankle Ability Measure     | No  |  |
| Lower Extremity Functional         | No  |  |
| Scale                              |     |  |
| Physical Impairment Measures       |     |  |
| Ankle swelling                     | Yes |  |
| Range of motion                    | Yes |  |
| Talar translation                  | Yes |  |
| Talar inversion                    | Yes |  |
| Single leg balance                 | Yes |  |
| Hip abduction                      | Yes |  |
| Extension                          | Yes |  |
| External rotation strength         | Yes |  |
| Activity Limitation/Physical       |     |  |
| Performance Measures               |     |  |
| Single limb hopping under          | No  |  |
| timed conditions                   |     |  |
| Interventions                      |     |  |
| Chronic Ankle Instability          |     |  |
| External support                   | No  |  |
| Therapeutic exercise and activity  | Yes |  |
| Manual therapy                     |     |  |
| Dry needling                       | No  |  |
| Combined treatments                | No  |  |

the evaluation. Included in the CPG, Feger et al<sup>26</sup> showed no long-term differences in outcomes between those rehabilitated exclusively with supervised therapy compared to a HEP,26 which justifies the use of independent exercise in this population. Regular re-testing ensured the effectiveness of the HEP and provided a basis for progression. Prophylactic bracing and taping were not prescribed, as supported by the CPG, because the hypothesized source of instability was neuromotor and not mechanical. In order to focus on administering outcome measures and progress the patient's HEP, manual therapy was not used early in the rehabilitation process. No passive modalities such

**Figure 1.** Functional Classification Based on the International Classification of Functioning, Disability, and Health Indicating the Interaction Among Domains of Function that Underlie the Patient's Clinical Presentation





<sup>a</sup>Nociceptive, emotional, and cognitive factors were determined to be the primary factors. Central nociplastic factors did not appear to play a significant role in the patient's clinical presentation. as cryotherapy, diathermy, electrotherapy, laser, ultrasound, or dry needling were used due to a paucity of supporting evidence in the literature reported in the CPG, physical therapist training, and in the case of dry needling practice act restrictions. Finally, there were no interventions aimed specifically at addressing psychological factors because the patient did not demonstrate any fear-avoidance or central sensitization behaviors at any point during the plan of care (**Figure 2**).

### **CONCLUSION**

This case study described the rehabilitation of an individual with CAI through application of a CPG. The plan of care was guided by the Ankle Stability and Movement Coordination Impairments: Lateral Ankle Ligament Sprains Revision 2021 CPG. After this rehabilitation program, the patient demonstrated clinically important improvements in ankle range of motion, strength, proprioception, and neuromuscular control, which allowed a full return to prior level of function. This case study demonstrates how application of a CPG can balance the use of recommendations based on high-quality research evidence with a patient-centered approach to care.

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## CLINICAL PRACTICE GUIDELINE NEWS!

Two new CPGs are now available on the Academy of Orthopaedic Physical Therapy (AOPT) website!

• Lateral Elbow Pain and Muscle Function Impairments CPG

### and

• Exercise-Based Knee and Anterior Cruciate Ligament Injury Prevention CPG

### Stay tuned for the upcoming Clinical Practice Guidelines (CPG) revisions currently in development!

### Late Spring/Early Summer 2023

- Non-arthritic Hip Joint Pain
- Heel Pain Plantar Fasciitis

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### ABSTRACT

Background: Herpes simplex type 2 (HSV-2) is one cause of radiculopathy that may be under-recognized by physical therapists as a cause of radiating limb pain. Case Presentation: A 67-year-old woman presented to physical therapy with acute onset of low back and left knee pain, left lower extremity weakness, and an absent quadriceps deep tendon reflex. She had recently been discharged from pelvic floor physical therapy for pudendal neuralgia diagnosed by the patient's gynecologist 6 months prior. Outcome: The patient had minimal initial relief with physical therapy interventions for her lumbar radiculopathy. She then was diagnosed with HSV-2 with recurrent outbreaks. The patient experienced improvement with daily acyclovir. Discussion: The patient's diagnosis of HSV-2, monthly viral outbreaks, and no lasting improvements with non-pharmacological treatment led to the identification of HSV-2-related radiculopathy. Clinical Relevance: This case study illustrates the importance of physical therapists considering the neurological complications that can arise with HSV-2.

**Key Words:** sexually transmitted infection, physical therapy, examination, evaluation, intervention

### **INTRODUCTION**

Genital herpes is a sexually transmitted infection caused by the herpes simplex virus type 1 and type 2 (HSV-2). In 2018, the Center for Disease Control and Prevention (CDC) estimated that there were 572,000 new genital herpes infections in the United States in people ages 14-49.<sup>1</sup> Most people are asymptomatic or have very mild symptoms that may go unnoticed or misdiagnosed.<sup>2</sup> An estimated 87.4% of people infected with HSV-2 never receive a clinical diagnosis. Once infected, the virus establishes latency in the peripheral sensory ganglia and persists in its host for a lifetime.<sup>2</sup>

When symptomatic, the most common signs associated with HSV outbreak include one or more vesicles or small blisters on or around the genitals or mouth with an average incubation period of 4 days following exposure. The vesicles then break and leave painful ulcers that can take 2-4 weeks to heal after the initial herpes infection. This is considered the first herpes 'outbreak' or episode. Symptoms can differ from the first and recurrent outbreaks.3 The first outbreak is typically the most severe and has a longer duration of symptoms, often presenting with systemic symptoms like fever, body aches, swollen lymph nodes, and headaches. Recurrent outbreaks are usually shorter and less severe, however, prodromal symptoms can include genital pain, tingling or shooting pains in the legs, hips or buttocks and can appear hours to days before the eruption of herpetic lesions.<sup>3</sup>

Neurological symptoms may occur with HSV-2 viral infection, since it is responsible for the most significant neurological morbidity compared to any other virus.<sup>2</sup> Most people will have mild and self-limiting neurological symptoms. However, some cases are more severe and can affect the retina, brainstem, cranial nerves, spinal cord, and nerve roots. Neurons in the sacral ganglia are the typical site of HSV-2 latency.<sup>2</sup> Polymerase chain reaction (PCR) testing has shown that latent HSV also exists throughout the central nervous system once infected and may reach ganglia far removed from the primary site of infection.<sup>2</sup>

One possible complication of HSV-2 includes HSV-2 radiculopathy. Herpes simplex type 2 radiculopathy affects the lumbar and sacral nerve roots and is often recurrent throughout a person's lifetime. Herpes simplex type 2 radiculopathy is commonly misdiagnosed unless it occurs at the same time of the initial outbreak.<sup>2</sup> It can occur from either the primary infection or the reactivation of latent HSV-2. Although outbreaks usually resolve on their own within days to weeks, recovery can be accelerated with antiviral medications like Acyclovir as both a suppressive therapy as well as episodically to ameliorate or shorten the duration of lesions.<sup>2,7</sup> Acyclovir is currently the confirmed medication for a diagnosis of HSV-2 lumbosacral radiculitis. It is difficult to accurately diagnose HSV-2 radiculitis secondary to its unspecified symptom presentation. Urinary retention, constipation, erectile dysfunction, dull pain in the anogenital region, paresthesias, loss of sensation in the lower limbs, absent or diminished deep tendon reflexes, and leg weakness are possible symptoms.<sup>4</sup> Radiculopathy due to HSV may be mistaken for lumbar radiculopathy because of a similar clinical presentation.<sup>4</sup> The purpose of this case study is to describe the clinical reasoning process that led to a differential diagnosis of HSV-2 induced lumbar radiculopathy.

### **CASE PRESENTATION**

The patient was a 67-year-old female who presented to physical therapy with a one-year history of constipation, pelvic and vaginal pain that was diagnosed as pudendal neuralgia by her gynecologist. The patient was negative for all sexually transmitted diseases and infections tested at that time. The patient's symptoms slowly improved, and she was eventually discharged from pelvic floor physical therapy after 9 visits over 8 weeks.

Approximately 6 months later she returned to physical therapy and reported her initial HSV-2 testing that she took the previous year was a false-negative and she had HSV-2. Her first outbreak produced ulcers as well as burning near the vagina and what felt like "hot liquid" running down her inner thighs. The patient's main goal for her second round of physical therapy was to understand the new symptoms she was experiencing in her legs and review the pelvic floor exercises given to her previously.

On her third visit, the patient came in with acute low back pain that she believed

was caused by helping her daughter move the week before and complaints of pain in her left knee. One week later, her back pain diminished, however, she continued to have left knee pain that she reported also felt unstable, achy, weak, and sharp with initial steps.

The patient continued to have left knee symptoms with an inability to fully extend her knee and a progressively worsening antalgic gait. The aggravating factors were walking, standing for 10+ minutes while working as a massage therapist, and upon waking in the morning. The patient believed the cause of her knee pain was from a torn anterior cruciate ligament, related to an injury over 20 years before the present session. The patient had not found an effective remedy for her knee pain and had not experienced these symptoms in the past. The only related past medical history was a recent diagnosis of HSV-2 and taking acyclovir intermittently when symptoms occurred. Outbreaks occurred monthly since initial diagnosis. Magnetic resonance imaging (MRI) of the lumbar spine was normal. The patient was a massage therapist and lived alone. Her local support network included her friends and children. The patient's goal was to return to her work as a massage therapist, hike, and take care of her grandchildren.

### **EXAMINATION**

On observation, the patient was unable to fully extend her left knee with standing or ambulation. Lumbar active range of motion (ROM) produced no back pain but increased pain in the left posterior knee and demonstrated a pivot point at the thoracolumbar junction. There was no pain or symptom reproduction with active lumbar extension or bilateral sidebending and was within normal limits of all spinal motion. When performing the lower quarter neurological screen, L3 dermatome was impaired, patellar reflex was absent on her left and 2+/5 quadriceps strength (moved through partial range of motion) as well as a positive slump for left posterior knee pain. Weakness was measured by manual muscle tests where 5/5 the patient is able to hold the test position against strong pressure in an anti-gravity position whereas a 0/5 there is no muscle contraction felt with palpation.<sup>5</sup> Accessory motion of the lumbar spine using passive accessory intervertebral movement (PAIVM) revealed painful hypomobility throughout her lumbar spine. The most severe pain was localized at L1-3 bilaterally with a unilateral posterior to anterior assessment. This PAIVM brought on both pelvic pain and left knee pain. The patient's hip ROM in flexion, external rotation, and internal rotation was normal and did not reproduce any pain or other symptoms.

### **EVALUATION**

The patient's presentation best fit a diagnosis of lumbar radiculopathy. However, her recent diagnosis of HSV-2 led to the inclusion of HSV-2-related radiculitis in the differential diagnosis due to the possibility of a latent viral outbreak causing symptoms. Using the ICF model, impaired body function and structures were hypomobility and pain at L1-3 bilaterally, absent patellar reflex, positive slump, and a 2+/5 quad muscle strength with myotomal strength testing. When performing lumbar traction inside a doorway in hook lying, the patient was able to increase her quadriceps strength from a 2+/5 to a 3+/5(holds test position against slight pressure).<sup>5</sup> Combined, these impairments were believed to be the main cause of the patient's activity limitations of walking and her inability to fully straighten the leg, limiting her ability to hike and work as a massage therapist in addition to the sensation of feeling 'unstable' in the knee joint, possibly due to a disrupted anterior cruciate ligament.

#### **INTERVENTION**

The patient was educated on the pertinent physical therapy examination findings, prognosis and the plan of care, and dosage of her home exercise program. She had been seen 20 times over 8 months, focusing on her knee range of motion, weakness, and pain. Over the course of her treatment, the patient received grade II unilateral posterior-anterior mobilizations (UPAs) to her left L1-2 facet joints, prone press ups, traction inside the doorway with a dowel, and slump nerve glides. All interventions improved her left knee range of motion (from approximately -20° extension to 0°), decreased knee pain with walking, and improved her quadriceps strength from 2+/5 to 4-/5. Although these interventions produced remarkable improvements within the patient's sessions, they only lasted 10-20 minutes when performed at home and there was limited carryover in clinical improvement between sessions.

#### **OUTCOMES**

Initially, the clinical presentation best fit a diagnosis of lumbar radiculopathy. However, with a recent diagnosis of HSV-2, monthly viral outbreaks, and no lasting improvements with conservative treatment, a differential diagnosis of HSV radiculopathy due to recurrent latent viral outbreaks was considered. The patient began steadily improving once she began a pharmacological suppressive regimen of daily acyclovir.

#### DISCUSSION

The patient in this case presented with absent deep tendon reflex, left lower extremity weakness, constipation, and neural tension, consistent examination findings with a subset of patients with HSV-2 virus that experience lumbar radiculopathy. The patient's recent diagnosis of HSV-2 would have gone unknown had she not been receiving pelvic floor physical therapy and had the attending physical therapist been unaware of her signs and symptoms of constipation and pelvic pain. A therapeutic alliance was well established from the episode of pelvic physical therapy to establish the patient's comfort to disclose and discuss her diagnosis of recurrent outbreaks of HSV-2.

Herpes simplex type 2 associated radiculitis is rare and difficult to diagnose due to its similar signs and symptoms to other pathologies. In the majority of patients with HSV-2-associated radiculitis, signs and symptoms are urinary retention, constipation, erectile dysfunction, dull pain in the anogenital region, dull or absent deep tendon reflexes, paresthesias, loss of sensation or leg weakness.6 These symptoms could relate to a number of other diagnoses including possible reactivation of other viruses (eg, HSV-1, cytomegalovirus, Epstein-Barr virus, or varicella zoster virus), cauda equina syndrome, Guillain-Barré syndrome, neuromyelitis optica, myelopathy, tumor, or conus medullaris.6

Gold standard testing to confirm HSV-2 radiculitis includes cerebrospinal fluid analysis, PCR testing, and magnetic resonance imaging (MRI). The MRI findings for a viral radiculomyelitis may show a varying degree of root or lower spinal cord edema with enlargement and hyperintensity on T2weighted images with contrast enhancement in acute infection; however, it is also possible that MRI findings are normal, as was the case for this patient.<sup>6</sup> Accurate diagnosis of HSV may be challenged by availability of testing, particularly in rural areas, false negatives, inconclusive MRI findings, and health care providers being unaware of less frequent signs and symptoms of HSV-2.4

Antiviral medications like acyclovir, famciclovir or valacyclovir are the preferred treatments for treating HSV-2 outbreaks as both a suppressive therapy as well as episodically to ameliorate or shorten the duration of



lesions.<sup>7</sup> Acyclovir is currently the preferred medication for a diagnosis of HSV-2 lumbosacral radiculopathy. It is highly recommended to follow-up with patients the first year of diagnosis due to a high recurrence rate of 30% or more.<sup>1</sup> Initially the patient was taking acyclovir as an episodic treatment, however, due to recurrent monthly outbreaks, her physician advised her to begin suppressive therapy, which can reduce herpes recurrences by 70-80%.<sup>7</sup> When the patient began daily acyclovir, symptoms steadily improved.

Because HSV-2 associated radiculitis is rare and often misdiagnosed, health care providers and physical therapists must be aware of the association between these symptoms and the appropriate line of treatment. Physical therapists must be aware of (and comfortable asking) about relevant medical history including sexually transmitted diseases as possible signs and symptoms that may be associated with primary and latent reactivation of those viruses.

### CONCLUSION

Lumbar radiculopathy and HSV-2 radiculitis can have similar patient presentations and are difficult to differentiate. Physical therapists should consider a possible primary or reactivation of herpes simplex type 2 in association with lumbar radiculopathy symptoms in their differential diagnosis of radiating lower extremity symptoms. While symptoms initially may appear to respond to physical therapy treatment, worsening radicular symptoms in people with known HSV should be promptly referred to the medical team for consideration of potential antiviral medication to improve radicular symptoms as rapidly as possible.

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### Using Clinical Decision Making to Identify the Appropriateness of Telehealth Physical Therapy: A Case Series

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### ABSTRACT

Background: The purpose of this case series is to highlight the shared decisionmaking process made between clinician and patient when determining the appropriateness of telehealth, in-person care, or a hybrid model. Case Descriptions: This case series describes 3 patients diagnosed with various musculoskeletal conditions causing pain and participation restrictions. Two patients received a hybrid model of care and one patient received telehealth physical therapy only. Outcomes: Two patients achieved desired goals and resumed participation in previously restricted activities. One patient did not achieve desired goals and eventually underwent total hip arthroplasty. Discussion: Case complexity, symptom irritability and severity, and changes in functional status can help determine the optimal mode of care. Patients with more complex presentations might benefit from in-person visits to achieve goals. Clinical Relevance: A clinical reasoning framework can guide shared decision-making to determine whether telehealth, in-person care, or a hybrid model is most appropriate to produce desired outcomes.

**Key Words:** clinical reasoning, examination, evaluation, telerehabilitation, physical therapy

### **INTRODUCTION**

Telehealth, or telemedicine, is the use of medical information delivered through electronic communication.<sup>1</sup> Telehealth can be synchronous, where patients interact with their providers in real time via video or telephone, or asynchronous, using communication to send resources, modify a patient's home program, and pre-program messages to assess a patient's status within and after treatment plans.<sup>2</sup> Telehealth has been a part of healthcare for many years, but its utility has increased rapidly due to the necessary response to the novel coronavirus 2019 (COVID-19) pandemic.<sup>3,4</sup> As laws and regulations evolve around COVID-19, telehealth appears to be an aspect of care that will continue.

Telehealth has often been used as an adjunct to in-person care, not as a replacement.<sup>5</sup> Evidence supports telehealth as a valid and reliable mode of assessment for physical therapists' measurements of swelling, range of motion, pain, strength, balance, and gait for musculoskeletal conditions.<sup>3,6</sup> Current evidence supports in-person care, telehealth-only, and hybrid models of care where both are used. Evidence also indicates high patient satisfaction when telehealth alone is offered.1 Several studies emphasize growing support for a hands-off approach to improve quality of care and self-efficacy. The functional and health-related quality of life outcomes also appear comparable for both modes of care despite absence of physical touch.<sup>7,8</sup> However, the lack of physical touch from providers is something that both patients and providers consider a barrier to providing quality of care.

Despite the growing literature on telehealth efficacy, few descriptions of practice are available to help therapists determine when and who would be most appropriate for telehealth, in-person, or a hybrid model of care. Developing an understanding of the factors that determine who will benefit from telehealth alone versus a hybrid model of care will help clinicians and patients efficiently get the care they need and possibly improve accessibility. This case series describes the shared decision-making process between physical therapist and patient to determine the appropriateness of telehealth physical therapy to achieve desired functional outcomes.

### **CASE DESCRIPTIONS**

### Patient 1

Patient 1 was a 61-year-old male referred to physical therapy by his primary care physician for left-sided neck and shoulder pain. The patient described pain spanning the left upper trapezius region of insidious onset. His chart review revealed history of complex regional pain syndrome, cerebral palsy, peripheral neuropathy, and history of lumbar radiculopathy with right foot drop. There was limited use of his right hand due to cerebral palsy, as well as unrelated and unchanged tingling in the left hand that was attributed to chronic carpal tunnel syndrome. Neck and hand symptoms occurred in isolation from each other. Functional limitations included difficulty sitting upright at his computer for work, driving, laying supine or side lying in bed, reaching, and using an elliptical trainer. All red flag screening questions were negative. Collaborative goals were established for independent symptom management, improved sitting tolerance at a computer, and return to using an elliptical trainer 2 times per week without pain.

Physical examination included postural assessment, cervical active range of motion (AROM), shoulder girdle AROM, and a patient administered Tinel's test at the carpal tunnel. Upper limb tension tests to assess neural mechanosensitivity has not been supported in the literature, so this was deferred.7 The patient demonstrated functional shoulder ROM, pain with cervical extension, pain with left side bending, and pain limited left cervical rotation. Examination of the cervical spine did not elicit distal peripheral symptoms, and a positive Tinel's at the carpal tunnel led the treating therapist to consider 2 discrete conditions versus cervical radiculopathy. The physical therapist determined a clinical physical therapy diagnosis of neck pain with mobility deficits with concurrent symptoms consistent with left carpal tunnel syndrome. The patient was seen every 2 weeks for 12 weeks with interventions targeting postural awareness, pain-free cervical ROM, and increased deep neck flexor motor control. The patient had low symptom irritability and severity and reported previous success with physical therapy that emphasized selfefficacy through an independent exercise

program. The patient preferred to try to manage symptoms via telehealth with the home exercise program and education on postural awareness, graded activity exposure, and pain science. Limitations of telehealth including absence of physical touch and standardized testing for muscular weakness and mechanosensitivity were discussed with the patient. It was agreed that an in-person meeting could be scheduled for subsequent visits if the patient's presentation did not change in frequency, intensity, or duration.

### Patient 2

Patient 2, a 36-year-old male referred to physical therapy by his primary care provider for insidious chronic patellofemoral pain syndrome. Relevant medical history included hyperlipidemia and hypertension. The patient described pain at the superior-medial border of the right patella and in the popliteal fossa that was exacerbated by squatting, kneeling, sitting more than 30 minutes, descending stairs, twisting motions; this limited his ability to participate in running or playing soccer. All activities of daily living (ADLs) were performed comfortably, the patient was not restricted in his ability to perform his work, and symptoms were absent with assessments of higher vigor. The patient had tried to manage his symptoms independently with exercises recommended by a friend who was a physical therapist, but he was only getting temporary relief with a piriformis stretch.

During the video examination, the patient demonstrated slight hamstring and rectus femoris tightness, pain with selfpalpation to the medial right knee and in the popliteal fossa, exaggerated weight shifting to the uninvolved side with double limb squats, and inability to perform a single leg squat on the affected limb. Self-administered Thessaly's and patellar compression tests were unremarkable. The initial assessment was local somatic knee pain consistent with his medical diagnosis of patellofemoral pain syndrome with likely muscle performance deficits. Collaborative goals included independent symptom management, improved sitting tolerance for work and travel requirements, and ability to perform 5 single leg squats with good technique to navigate stairs without pain.

The home program for this patient consisted of functional quadriceps strengthening, dynamic rectus femoris stretching, and hip abductor motor control training. He was educated on the potential nature of symptoms, benefits of activity modification, and the rationale of his home exercise program. The patient and the physical therapist determined telehealth appointments every 4 weeks for 12 weeks would be appropriate due to the low irritability of his symptoms and emphasis on active interventions. Interventions would focus on movement coordination training with single leg tasks, improved lower extremity flexibility, and activity modification to limit symptoms with prolonged sitting at work. Graded activity exposure was a key point of emphasis during education on activity modification.

### Patient 3

Patient 3 was a 75-year-old retired male referred to physical therapy by his orthopaedic surgeon for right hip bursitis. The patient had received a cortisone injection prior to starting therapy. Chart review included previous history of low back pain with right sided radiculopathy, prediabetes, osteoarthritis of the right hip, hypertension, and hyperlipidemia. During the patient's first appointment via telephone, the treating therapist prioritized the subjective portion of the patient interview as well as red and yellow flag screening using facility guidelines. The patient described his current symptoms on the right side as identical to what led to a total hip arthroplasty (THA) on the contralateral hip. There was limited upright activity tolerance of less than 5 minutes, frequent sleep disturbances, and an inability to participate in jogging, working out, and golfing. The treating therapist provided basic education on activity modification, sleep positioning, pain science, graded activity exposure, and symptom modulation with available modalities. The patient was open to either telehealth or in-person care, but as the patient was limited in ADLs, the therapist felt that an in-person visit may be beneficial. As the physical therapist had limited appointment availability, the second visit was scheduled as a video visit to minimize time between clinical encounters.

At the second visit, the patient described minimal changes in tolerance to activity around the home but reduced sleep disturbances due to pain after the therapist's recommendation to use a pillow between the knees at night. The video physical examination consisted of hip range of motion, lumbar range of motion, and squatting technique and tolerance. Chief area of pain was reproduced with hip ROM in all planes assessed, isolated lumbar extension and bilateral lumbar rotation. Interventions addressed lumbar mobility, lower extremity flexibility, and gluteal isometrics for pain modulation. At this time the physical therapist recommended the next appointment be in-person if his functional status was not improving. The in-person visit would further assess his condition and potentially provide manual interventions for symptom modulation. An automated secure message was scheduled to assess change in the patient's tolerance to standing and walking because these were the 2 most important activity limitations impacting his quality of life.

Via secure email, the patient communicated fluctuating symptoms and tolerance to the prescribed home exercise program. The patient and physical therapist determined an in-person appointment was more appropriate due to the high irritability and severity of symptoms, along with failed management thus far through video visits alone. This time the physical therapist was able to schedule the in-person visit in a timely manner. At this appointment, the patient's hip range of motion, passive accessory movement of the lumbar spine and hip, hip special testing, and a Thomas test were assessed. Lumbar extension and bilateral lumbar rotation continued to be the only movements to provoke his primary symptoms. Secondary symptoms were reproduced with Flexion-Adduction-Internal-Rotation (FADIR) and scour tests, along with unilateral posterior to anterior mobilizations to the right L4-5 segments. The working physical therapy assessment was modified to right femoral-acetabular joint pain with hypomobility deficits versus right L4-5 facet referred pain. Though the physical therapist preferred to continue with in-person appointments to further assess the nature of symptoms, due to lack of appointment availability, a video visit was scheduled to minimize the duration between the visits. The higher complexity of his presentation and multiple body regions implicated by in-person assessment appeared to warrant additional in-person appointments to address this patient's concerns effectively, which were scheduled and undertaken.

### OUTCOMES

### Patient 1

Patient 1 was seen for 4 visits over 12 weeks, with 3 video appointments and a single in-person appointment. At his final visit, the patient had 0/10 resting pain on the numerical pain rating scale (NPRS) and demonstrated cervical active range of motion within normal limits in all planes without reproduction of any symptoms that brought him to physical therapy. Established goals were achieved, consisting of independent management of symptoms and resuming use of the elliptical trainer twice a week without limitations. There was improved sitting tolerance at his computer for prolonged periods for work and stated reaching was no longer painful. After the patient's fourth and final visit, he felt he could manage symptoms moving forward independently without continued treatment. In a followup secure email, a month after his final video appointment, the patient reported his symptoms were completely resolved.

### Patient 2

Patient 2 was seen for 3 visits over 6 weeks, all via video sessions. The patient met goals for independent management of symptoms as well as improved sitting tolerance of more than one hour for work duties and travel requirements. There was 0/10 resting symptoms on the NPRS and was able to perform body weight squats without compensatory strategies or pain. The patient further requested to manage symptoms independently with a progressive home exercise program after his third visit. In a follow-up secure message, the patient reported that he had returned to running without pain and that he planned to try soccer soon. He expressed that his exercises were appropriate and that he felt capable of continuing with independent management. A follow-up message was sent via secure communication about a month after the last session, to which he responded that the symptoms had resolved, he had independently progressed his strengthening exercises and he had resumed participation with higher impact activities without setback.

### Patient 3

Patient 3 was the only patient who did not progress as desired toward his collaboratively established goals. There was continued intermittent difficulty sleeping, poor standing tolerance, reduced walking capacity, and complete inability to participate with working out, jogging, and playing golf. Walking and standing tolerance remained below 10 minutes before severe pain. Orthopaedic manual therapy interventions, home exercises, and activity modification provided minimal, temporary relief. The patient's tolerance to his home exercise program fluctuated, with frequent adjustments to exercise vigor based on symptom irritability.

After 10 visits over 16 weeks, shareddecision-making with the patient, the physical therapist, and the orthopaedic surgeon determined a right THA was necessary. The patient underwent surgery for an anterior THA one week after his final video visit with physical therapy. Followup communication between this patient and his treating physical therapist occurred 2 days after surgery via secure email email. He reported a significant reduction in pain and planned post-operative rehabilitation through group therapy. The patient was discharged from a group therapy program for THA following achievement of all established physical therapy goals.

### **DISCUSSION**

Telehealth is an effective mode of practice for physical therapists to assess and treat patients with musculoskeletal diagnoses.<sup>3,6,7,10–12</sup> It allows physical therapists to emphasize active interventions and use their skills as effective communicators to provide education that promotes selfefficacy.7 Many patients who receive telehealth report high quality healthcare and value the services provided.5 For example, Patient 1 was seen for 3 visits by video and 1 visit in-person. The in-person visit allowed for in depth review of his home exercise program and for tactile cueing to improve technique, which resulted in performance of his exercises without symptom provocation. This session also allowed for manual therapy for symptom reduction with painful asterisk signs from the examination. Despite benefits from the in-person visit, future visits were accomplished through telehealth due to this patient's high self-efficacy and overall ability to manage symptoms independently (Figure).

There are limitations in what can be reliably assessed, but a hybrid model of care can help providers fill in gaps in their examination by telehealth at subsequent inperson visits as appropriate.9,12 For patients assessed through telehealth who require higher intensity of care, in-person visits may be required to supplement telehealth services.<sup>7,13</sup> This can include patients with higher pain severity and irritability, limited improvement with intervention, and low patient self-efficacy (Figure). In 2 of the cases of this series, the patients had low irritability and high self-efficacy, which then indicated a good prognosis with just video visits. This allows for more independence for the patient as well as more patient access to in-person appointments for those who need it, including Patient 3, whose symptoms did not improve and ultimately required surgical intervention.

Strengths of this case series include clearing pertinent medical conditions to determine whether patients were appropriate for physical therapy through video and telephone initial evaluations. The treating therapist obtained objective measurements and established collaborative, measurable goals using adapted processes and practices used for in-clinic visits that did not require specific additional training for the physical therapist to complete. This report also supports emerging literature encouraging more active interventions as the primary emphasis of physical therapy over more passive means.<sup>7</sup>

There were several limitations in this case series. Video equipment could not be freely manipulated; this limited the physical therapist's ability to view the patients' movements. Limitations in video capacity to capture movement in multiple planes could have hindered the information gained during observation of various physical exam measures and placed more of an onus on the patient to subjectively describe what they were experiencing (Figure).<sup>11</sup> A lack of specific training in telehealth may have reduced the quality of assessments. A personal bias held by the treating physical therapist to prefer face-to-face delivery of physical therapy has been identified as an important factor in the success of telehealth (Figure).<sup>9</sup> Although this did not occur during this series, patients also can have a preference for in-person therapy that can limit progress with telehealth. Outcomes were based on subjective and objective markers, but there was no formal patient specific outcome measure provided in any of the three cases detailed.

Physical therapists providing telehealth should receive ample training in the assessment and treatment of musculoskeletal disorders to provide high quality services. Patients should be notified in advance of the expectations for a physical therapy visit performed through telehealth. This should include available space to move, adequate camera and lighting for optimal visibility, equipment to have available and the assumption that exercise will be performed during the session. This case series detailed the physical therapy care of 3 patients and the factors to be considered in determining if a patient is appropriate for stand-alone telehealth versus a hybrid model of care. The treating physical therapist used patient preference, case complexity, symptom severity and irritability, subjective markers of functional change, objective examination, and mutual preference between the patient and physical therapist to determine the most appropriate mode of care.

**Figure.** Factors Serving as the Basis for Shared Decision Making Between Physical Therapists and Patients/Clients for Telehealth Physical Therapy or Face-to-Face Appointment



Future research should assess the appropriateness of various modes of delivery for physical therapy evaluation and treatment, and how patient- and cliniciancentered factors influence mode selection. As technology develops and changes in health care delivery related to the COVID-19 pandemic continue to evolve, telehealth may shift from unknown and uncomfortable to more of a norm, allowing patients better access to care. At the same time, patient and physical therapist preference can still influence prognosis of treatment and patienttherapist relationship warrants individual assessment for the best mode of care. The evidence for the benefits of telehealth as well as the preferences and limitations of the patient and the therapist should all be considered in the decision-making process for a plan of care to ensure individualized and appropriate treatment.

### CONCLUSION

This case series describes the different circumstances and the relationship between provider and patient in determining when telehealth is an adequate mode of care for physical therapy and when a hybrid model might be necessary. Patient preference, physical therapist preference, high selfefficacy, symptom irritability and severity, and a patient's activity limitations and participation restrictions can help guide a patient to the most appropriate mode of care for best outcomes.

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## JOSPT® Transitions to Online-Only Publication

Beginning January 2023, *JOSPT* will move to online-only publication. As demand for a printed journal has declined, paper has become more difficult and expensive to acquire, and shipping has become less reliable, *JOSPT* has decided to transition to a digital-only product. Readers will be able to access journal content at <u>www.jospt.org</u>.

If you don't already have an account on <u>www.jospt.</u> org, we encourage you to create one to ensure access. JOSPT's website provides access to articles published from 1979 to date and seamless content delivery to web and mobile devices. You'll also find videos, downloadable slides of figures and tables, and the continuing education program, Read for Credit, on <u>www.jospt.org</u>.

You'll also find *JOSPT Cases* online. *Cases* was launched in 2021 with the aim to translate research to rehabilitation practice using decision trees, videos, patient narratives, and self-assessment tools. Issues are published quarterly in February, May, August, and November. Readers may subscribe to *JOSPT Cases* individually or upgrade to a discounted bundled offer of *JOSPT* + *JOSPT Cases*.

All current members of the Academy of Orthopaedic Physical Therapy (AOPT) and the American Academy of Sports Physical Therapy (AASPT) members have access to *JOSPT* content included in their membership. Please be sure to use the email address on file with APTA when logging into <u>www.jospt.org</u> to ensure that you have access. Access to *JOSPT Cases* is not included and must be purchased separately.

As a reminder, *JOSPT* makes much of its content free to serve our organizational mission. Readers can always access <u>Clinical Practice Guidelines</u>, Infographics, <u>Perspectives for Patients</u>, the <u>JOSPT</u> <u>Blog</u>, and <u>JOSPT Insights</u> podcast at no cost.

Please contact <u>jospt@jospt.org</u> for questions or help with your online account.

## AGE-RELATED CHANGES IN THE MASTER FEMALE ATHLETE

ISC 32.2, THE FEMALE ATHLETE THROUGHOUT THE LIFESPAN Theresa L. Schuemann, DPT, DPT, SCS, ATC

After age 35, the following changes occur:

### CARDIOVASCULAR

- HRmax decrease by 5-10 beats/decade
- Decreased stroke volume
- Decreased cardiac output
- Decreased vessel compliance
- Slower recovery (slow return to resting heart rate)

### RESPIRATORY

- Decreased elasticity of lung tissue
- Increased residual volume
- Decreased VO2max
- Decreased alveolar to arterial exchange
- Decreased vital capacity



### **MUSCULOSKELETAL**

- Decreased bone strength
- Decreased muscular strength
- Decreased flexibility

### **NEUROCOGNITIVE**

- Decreased nerve conduction
- Decreased sensation
- Decreased balance
- Decreased proprioception

### ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY



## MANAGEMENT OF HEADACHES

Independent Study Course 32.6

### Description

This course provides a comprehensive overview of primary (migraine headache and tension-type headache) and secondary (cervicogenic headache, occipital neuralgia, and post-traumatic headache) headache disorders. The physiology and underlying mechanisms of both primary and secondary headaches is discussed in combination with screening considerations for red flags. Subsequently, the inclusion criteria, according to the International Classification of Headache Disorders, for each of the 5 headache types listed above are provided. Then, the evaluation of patients with headaches with or without associated neck pain is thoroughly discussed, including the evaluation of musculoskeletal impairments of the cervical region while distinguishing between the expected clinical presentations more specific to the various types of headaches. This course also presents information on the specific additional evaluation methods for individuals with post-traumatic headaches, discussing the application of aerobic testing as well as the vestibular-ocular examination process. Finally, the authors review the management of patients with primary and secondary headache disorders, including addressing headache triggers and associated symptoms.

### **Topics and Authors**

Headache: Physiology and Mechanisms Underlying Differential Diagnosis Erica Sigman, PT, DPT, OCS Lori Ginoza, PT, DPT, NCS

Headache Evaluation Erica Sigman, PT, DPT, OCS Lori Ginoza, PT, DPT, NCS

Headache Treatment Erica Sigman, PT, DPT, OCS Lori Ginoza, PT, DPT, NCS





### **Learning Objectives**

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

- List common headache diagnoses that would be classified as primary headaches, secondary headaches, or neuropathies/ neuralgias.
- 2. Describe the diagnostic criteria for various types of headaches including migraine, tension-type headache, cervicogenic headache, occipital neuralgia, and post-traumatic headache.
- 3. Understand the proposed pathoanatomical mechanisms behind migraine, tension-type headache, cervicogenic headache, occipital neuralgia, and headache attributed to trauma to the head and/or neck.
- 4. Employ a headache diary in the evaluation of headaches to determine headache triggers and help develop an individualized plan of care.
- 5. Perform a musculoskeletal evaluation for primary and secondary headache disorders.
- 6. Create a treatment plan integrating physical therapy and other healthcare providers as needed in the multidisciplinary management of individuals with headache.

### **Editorial Staff**

Editor—Guy G. Simoneau, PT, PhD, FAPTA Associate Editor—Dhinu J. Jayaseelan, PT, DPT, OCS, FAAOMPT Managing Editor—Sharon Klinski

### For Registration Fees and Additional Questions,

visit orthopt.org

### **Concussion Fact Sheet:**

Optimize your Recovery from Concussion



### What is a concussion?

A concussion is a brain injury caused by a bump, blow, or jolt to the head or body that causes the head, neck and brain to move quickly back and forth. This trauma affects thinking (confusion, feeling "off", or in some cases a brief loss of consciousness) and may also affect the neck and the balance system. Physicians may describe a concussion as a "mild" traumatic brain injury because often no structural injury to the brain is seen.

### When should I see a doctor?

If you've seen a physician to diagnose your concussion, that is good. If you haven't and are having symptoms that are bothering you, see a physician as soon as you can. If you have symptoms that persist beyond the first few weeks after injury, rehabilitation treatment may be helpful to treat those issues.

### How long does recovery take?

80-90% of people with concussion will be symptom free within a few weeks. A gradual return to usual activities after a short period of rest often helps people recover. If you follow these recommendations, you will maximize your body's ability to heal. If you have physical complaints that are slow to improve, recovery may be aided by physical therapy.

### **Recommendations to Speed Recovery**



### Activity

**Rest for the first 24-48 hours.** Avoid any activities that could put you at risk of additional injury. Talk with your healthcare provider about whether your occupation involves activities that present a risk for another injury. You may not return to risky occupations until cleared by physician.

After the first 24-48 hours, try to resume basic usual activities, including your daily routine and if you tolerate that well, school or work. There may be some rehabilitation strategies to assist in re-integration.

After 48 hours, it is okay to start light exercise again. Slowly increase intensity as your symptoms allow.



### **Consistent Sleep**

Maintain scheduled bedtimes and awake times with no naps. Sleeping at night is the time your brain heals and napping inhibits night sleep. 7 to 9 hours of sleep at night is recommended.

Occasionally, people may experience more severe symptoms. If you experience any of the below symptoms, call your physician or go directly to the emergency room: Headaches that worsen significantly, slurred speech, seizures or loss of consciousness, increasing confusion, inability to awaken, severe neck pain, weakness/numbness in arms/legs, repeated vomiting, &/or unusual behavior changes.

### Manage Stress

**Perform some type of relaxation activity daily** (ex. Yoga, Mindfulness, Nature walk)



### **Eat and Hydrate**

**Eat a normal diet on a regular schedule.** Food is fuel for the brain and is needed during this time to help repair itself.



**Drink water throughout the day,** 2-3 (16-24oz) bottles of water/day.

**Do not drink alcohol**. This may delay your brain's healing & cause a resurgence of symptoms.

### For more information:

Evidence Based Clinical Practice Guideline: Physical Therapy Evaluation and Treatment After Concussion/ Mild Traumatic Brain Injury



https://www.jospt.org/doi/pdf/10.2519/jospt.2020.0301

This brochure summarizes published physical therapy clinical practice guideline recommendations on concussion management. Adherence will not ensure successful outcomes for everyone, nor does it include all proper methods of care aimed at the same results. Treatment plans must use clinical data presented by the patient/client/family, the diagnosis, available treatment options, the patient's values, expectations, and preferences, and the clinician's scope of practice and expertise.

APTA Academies of Neurology, Orthopedic, Pediatric, and Sports Physical Therapy © 5/2022



### **PRESIDENT'S MESSAGE**

Rick Wickstrom, PT, DPT, CPE, CME

Physical therapist, Dr. Joe Tata points out in his preface to a new book about lifestyle medicine that the next evolution for physical therapy practice will be to break the glass ceiling as primary health providers to take our place as leading the profession for nonpharmacologic and noninvasive health care. Physical therapists may have regulatory direct access in all states; however, there are many examples of perceptual and organizational barriers that limit how physical therapists function in entry-point of care. For example, it makes no sense that physical therapists are not recognized as a healthcare practitioner authorized to complete athlete pre-participation evaluation forms required by State High School Athletic Associations.

It is our responsibility to drive opportunities to optimize physical activity participation where individuals live, work, and play. We must better educate all stakeholders about the ability of physical therapists to render a physical therapy diagnosis using classification labels that identify the cause and/or nature of an individual's injuries, symptoms, emergent conditions, impairments, activity limitations, participation restrictions, biopsychosocial factors, environmental barriers, and facilitators. We should bear in mind the quote by Helen Keller (below) when advocating for recognition of our professional scope of practice at the entry-point of care.

> Never bend your head. Always hold it high. Look the world straight in the eye. —Helen Keller

To move this needle forward, OHSIG initiated a motion to communicate APTA's support for unrestricted access to physical therapists as entry-point practitioners for activity participation, wellness, health, and disability determination. This motion introduced by AOPT's Chief Delegate James Spencer was adopted by the 2022 APTA House of Delegates:

### ACCESS TO PHYSICAL THERAPISTS AS ENTRY-POINT PRACTITIONERS FOR ACTIVITY PARTICIPATION, WELLNESS, HEALTH, AND DISABILITY DETERMINATION

HOD P08-22-12-14 [Position]

The American Physical Therapy Association supports unrestricted access to physical therapists as entry-point practitioners for activity participation, wellness, health, and disability determination.

Physical therapists make unique contributions to the health care system and participation in society. Physical therapists, as part of a comprehensive management plan:

- Deliver a broad range of services including, but not limited to, examination, evaluation, diagnosis, prognosis, intervention, coordination of care, prevention, wellness, and referral to other health care practitioners when indicated.
- Identify the cause and/or nature of an individual's injuries, symptoms, emergent conditions, impairments, activity limitations, participation restrictions, biopsychosocial factors, environmental barriers, and facilitators.
- Render diagnoses, using relevant diagnostic tests and classification labels.
- Determine an individual's functioning and extent of physical disability in all aspects of life (such as health, recreation, employment, daily living, transportation), and for regulatory, insurance, and legal purposes.
- Prescribe or recommend physical activity, accommodations, adaptive and assistive technology, diagnostic tests, and other interventions to optimize functioning and participation in society.

The case study that follows by Joshua Prall, PT, DPT, EdD, OCS and Michael Ross, PT, DHSc, OCS, FAAOMPT is a great example of the value of physical therapy entry-point care at the worksite. Enjoy!

### ON-SITE INJURY TRIAGE BY A PHYSICAL THERAPIST IN AN INDUSTRIAL WORK SETTING: A CASE STUDY

Joshua Prall, PT, DPT, EdD, OCS<sup>1</sup> Michael Ross, PT, DHSc, OCS, FAAOMPT<sup>2</sup>

<sup>1</sup>Assistant Professor, Lebanon Valley College, Annville, PA <sup>2</sup>Associate Professor, Daemen University, Amhurst, NY

### **INTRODUCTION**

A crucial topic that has been discussed recently in physical therapy practice, as well as the physical therapy literature, is the rising costs associated with musculoskeletal disorders (MSDs) occurred by employees in the industrial workplace.<sup>1-8,9</sup> Musculoskeletal disorders are defined as pathological injuries to the bones, ligaments, joints, muscles, nerves, and vascular system that can affect the overall function of the human body. Work-related MSDs (WMSDs) are injuries to the musculoskeletal system occurring in the workplace, often labeled overexertion injuries by the Occupational Safety and Health Administration (OSHA).<sup>1-5</sup> These overexertion injuries include bending, crawling, twisting, lifting, pushing, and pulling. Most overexertion injuries in the workplace happen slowly over time and are a product of repetitive motions.<sup>1-8,9</sup>

The economic burden of both MSDs and WMSDs is substantial. Liberty Mutual Insurance reported in their safety index for 2021 that 19.1 billion dollars were spent on workplace musculoskeletal injuries.<sup>1-3,5,7</sup> This number continues to grow each year without any sign of slowing down.<sup>4</sup> A logical step for employers to address these concerns is to contract for on-site services with a healthcare professional who specializes in injury prevention, workplace wellness, and treatment of personal MSDs and WMSDs.<sup>1,10-12</sup> Physical therapists are well-positioned to help companies reduce the direct, in-direct, and total costs of WMSDs. Examples of effective direct-to-employer services include injury prevention education, office ergonomics training, job site assessments, return-to-work programs, and hands-on manual interventions, if applicable.<sup>13</sup> On-site interventions including ergonomic education, training, and exercise, have been shown to be cost effective, with employees spending significantly less money on health care costs when seeking treatment and advice on-site compared with offsite treatments.<sup>11,12</sup>

The purpose of this case study is to describe the effect a physical therapist can have on reducing WMSDs and associated costs of these injuries. A secondary purpose is to highlight this setting of practice for students and practicing physical therapists with an interest in occupational health and direct contracting that is outside the traditional insurance model to bill for services. *Total Worker Health*<sup>\*</sup> programs are gaining in popularity as a new value proposition for employers. *Total Worker Health*<sup>\*</sup> is defined as policies, programs, and practices that integrate protection from workrelated safety and health hazards with promotion of injury and illness-prevention efforts to advance worker well-being.

### **EMPLOYEE CASE**

The employee was a 64-year-old male construction worker who was triaged at the worksite by a physical therapist 3-4 hours after incurring a right ankle injury while performing construction duties at a manufacturing plant. The employee was carrying a 5-gallon drum and stepped in a hole while walking outside. The physical therapist was contracted by the manufacturer to provide on-site prevention and injury services to reduce injuries, increase productivity, and reduce overall costs of injuries throughout the year. As a foundation for injury and disability prevention, the physical therapist had conducted functional job analyses to communicate transitional work duties for job positions that could be immediately assigned to promote stay-at-work after a work-related injury. Cryotherapy was provided to the worker as a first aid measure and the worker was assigned suitable duties that could be performed while sitting that were acceptable to the worker. The employee was referred for consultation by the physical therapist that included a musculoskeletal examination of: (1) range of motion, (2) manual muscle testing, (3) special tests, (4) deep tendon reflexes, (5) lower quarter screen, and (6) application of the Ottawa Ankle and Foot Rule. The physical therapist concluded that the employee was appropriately accommodated with suitable duties and could stay-at-work with follow-up by the physical therapist to provide re-assurance, education, first aid modalities, and work activity progress without need for referred to external medical providers.

The physical therapist worked closely with the manufacturer to improve its outcomes for prevention of work-related injuries that are required to be recorded. Under this program, first aid may be administered and diagnostic exams may be performed without requiring the injury to be classified as an OSHA recoverable. The initial first aid response by the Environmental Health & Safety manager was to administer cryotherapy with elevation of the ankle to reduce swelling and improve short-term and long-term outcomes; improve range of motion, improve gait, pain reduction, and avoid loss time at work. Seated work was assigned that was acceptable to the worker that was described under expected duties in the job description. The employee was examined by the onsite physical therapist 3-4 hours later. This musculoskeletal exam consisted of lower quarter screening, deep tendon reflex testing of the patella (L3-4) and Achilles reflexes (S1-2), knee and ankle manual muscle testing, ankle range of motion, anterior drawer test and talar tilt, and a review of the employee's specific job description. Exam findings included a mild antalgic gait, minimal swelling, good strength (4/5) in his right foot in all 4 motions, normal reflexes, and minimal range of motion loss. These findings did not meet the Ottawa Ankle and Foot Rule, resulting in no need to send the employee to an external medical provider for a radiograph. Findings were consistent with a grade 1 right lateral ankle sprain (ICD code: \$93.401A). An official ICD diagnostic code was not necessary to bill for services by the on-site physical therapist, because the contract for physical therapy coverage did not require billing or authorization by an insurance plan.

The employee was diagnosed with the following participation barriers: (1) decreased standing tolerance (D4154: Maintaining a standing position), (2) climbing up steps (D451: Going up and down stairs), (3) Squatting (D4151: Maintaining a squatting position), and (4) antalgic gait (D4502: Walking on different surfaces). Due to this incident not being classified as an OSHA recordable injury and no requirement for external care, there was no workers' compensation claim filed. The employee was able to be managed entirely at work during their functional recovery and able to stay at work for medical treatment beyond first aid. He was also able to perform progressive duties within his job description that was overseen by his supervisor.

The management of work-related injuries in-house is a crucial step towards the overall health of the employees. This employee was managed in house by reviewing his job description, performing a job site safety analysis to determine the cause of the injury, and reviewing the findings with the employee after the initial physical therapy screen. This will help re-educate the employee on steps they can use moving forward to avoid this encounter. The outcome in this case study resulted in no OSHA recordable injury. This will result in the employers' workers compensation premium staying the same, no increase in total costs, and productivity remaining high due to the worker being able to stay at work.<sup>9-11</sup>

### **CLINICAL RELEVANCE**

The main goal for on-site physical therapy assessments should include keeping the worker working, if able, and identifying areas within the job description to prevent future injuries. Keeping workers working in a safe environment with advice, education, and modalities drastically reduces OSHA recordable injuries. This will save the company money by reducing direct, in-direct, and total costs of these musculoskeletal injuries.<sup>1-4</sup> It will also reduce worker's compensation premiums from rising and increase productivity, employee wellness, and decrease absenteeism among workers.<sup>1</sup> In 2019, OSHA wrote a letter to the American Physical Therapy Association concluding that physical therapists may provide examinations and some types of treatment such as soft tissue manual therapies and hot or cold therapies that is described under the OSHA's first aid rule without requiring the employer to report an OSHA-recordable injury or illness. This decision and ruling should enlighten all licensed physical therapists who are interested in working with workers in an on-site setting that they

can keep workers working, save companies significant money on avoiding workers compensation claims and OSHA recordable injuries, and serve a population that encounters many MSDs yearly.<sup>1-6</sup>

During the screen, the employee was ruled out for a fracture using the Ottawa Ankle and Foot Rule, and it was determined by the on-site physical therapists and the environmental health and safety director that the employee would be able to perform transitional duty tasks and stay at work until feeling well enough to go back to the full range of expected job duties. The employee was seen 2 times per week for 4 weeks by the on-site physical therapists to ensure he was progressing with his agility, range of motion, swelling, pain, and was able to perform more work-related job tasks throughout the day. Following up with the employee regularly allowed for the same return to 100% normal job function by this specific employee, while avoiding unnecessary outside medical treatment that is extremely costly for both the employee and the employer.

### CONCLUSION

The rising costs of MSDs in the industrial workplace continues to be a problem for both employees and the employers, due to absentee workers and rising costs associated with these overexertion injuries.<sup>1,8-10</sup> The results of this case study indicate that physical therapists can play a crucial role in reducing workplace injuries and reducing the associated high costs that accompany overexertion injuries in the industrial workplace. This case study provides a framework for future studies for physical therapists operating in an injury prevention consulting role in the industrial workplace setting. As the physical therapy profession continues to progress in its implementation of evidence-based practice, opportunities for physical therapists outside the traditional model of delivery for physical therapy are becoming more prevalent. Physical therapists are in an enhanced position to serve as trailblazers in direct-to-employer services such as on-site triage opportunities for manufacturers and other companies that reduce musculoskeletal injuries, reduce overall costs, and increase productivity.

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## OCCUPATIONAL HEALTH PRACTITIONER CERTIFICATE

### **Program Description**

The Occupational Health Practitioner (OHP) Certificate of Achievement is awarded to Physical Therapists (PTs) and Occupational Therapists (OTs) who complete a comprehensive series of 3 evidence-based courses that culminates with submission of an OHP portfolio and program reflection of Occupational Health Services. Recipients of the OHP Certificate of Achievement, who are active as members or individual partners, are also featured in the Academy's distinguished OHP website registry.

The OHP Certificate Program is coordinated by the Occupational Health Special Interest Group (OHSIG) of the Academy of Orthopaedic Physical Therapy, APTA. Its purpose is to empower members to optimize movement, musculoskeletal health, and work participation from hire to retire. This certificate program incorporates best practice recommendations from Clinical Guidance to Optimize Work Participation After Injury or Illness: The Role of Physical Therapists and other OHSIG Current Concepts resources that include the OHSIG Collective Glossary of Occupational Health Terms (now available as free download).

### Step 1: Bridging the Gap Between the Workplace and Clinic

ISC 32.4 is a 3-monograph independent study course. It covers best practice examples and regulations that support job accommodation and *Total Worker Health*<sup>®</sup>, with emphasis on workplace wellness, functional job analyses, functional employment exams, and entry point care. *Total Worker Health*<sup>®</sup> is defined as policies, programs, and practices that integrate protection from work-related safety and health hazards with promotion of injury and illness-prevention efforts to advance worker well-being. Each monograph concludes with applied case examples for prevention and management of musculoskeletal injuries, including the use of transitional work or simulated work tasks to promote stay-at-work or return to work after injury or illness.





### Step 2: Advanced Therapy Programs in Occupational Health

ISC 32.5 is a 3-monograph independent study course that covers best practice examples and regulations for comprehensive programs for ergonomics, work rehabilitation, and functional capacity evaluation.

Each monograph concludes with 3 or 4 applied case scenarios for advanced occupational health programs to prevent needless work disability, expedite functional recovery of injured workers, and validate the extent of physical disability.

### Step 3: Facilitating Therapy Services for Total Worker Health®

This interactive course is the final step to achieve the Occupational Health Practitioner (OHP) certificate of competency. Participants are assigned a mentor to support the development of competencies that integrate best practices for

therapy services to meet the *Total Worker Health*<sup>®</sup> needs of employers. PTs and OTs submit an OHP portfolio and program reflection that is peer-reviewed to verify competency with evidenced-based content.



### Pricing

| Level                   | AOPT Member or Partner* | Non-Member |
|-------------------------|-------------------------|------------|
| Step 1 Course (15 CEUs) | \$145**                 | \$245**    |
| Step 2 Course (15 CEUs) | \$145**                 | \$245**    |
| Step 3 Course (8 CEUs)  | \$495                   | \$645      |
| OHP Registry Listing    | Complimentary           | N/A        |
| TOTAL INVESTMENT        | \$785                   | \$1135     |

\*To become an Individual AOPT Partner: https://www.orthopt.org/content/membership/partner-program \*\*Additional cost of \$35 for each printed copy

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PERFORMING ARTS ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY, APTA

### **PRESIDENT'S MESSAGE**

Laurel Daniels Abbruzzese, PT, EdD | <u>labbruzzese@orthopt.org</u>

### PASIG MEMBERSHIP MEETING IN PERSON AT CSM!

As I end my first term as PASIG President, I am excited to announce that we will have our first in-person membership meeting in 3 years at the 2023 Combined Sections Meeting in San Diego! Join us on Thursday, February 23, 2023, 6:30-7:15 a.m. Meet fellow colleagues that share your passion for working with performing artists. Our meeting will be followed by PASIG Sponsored programming. Mark your calendars for these CSM events:

### Thursday Feb 23 6:30-7:15 am

PASIG General Membership Meeting

### Thursday Feb 23 8:00-10:00 am

PASIG Sponsored Programming OR-14476 Evidence-Based Lower Limb Updates in Dance: Risk Factors, Rehab, and Prevention Robyn Porter Rice, PT, MSPT, PhD and Dawn Muci, PT, DPT, ATC

Saturday Feb. 25<sup>th</sup> 12:00 – 1:00pm PASIG Screening Meeting

Saturday Feb. 25<sup>th</sup> 3:00 – 4:00pm PASIG Fellowship Meeting

Saturday Feb. 25<sup>th</sup> 1:00 – 3:00pm Performing Arts Poster Session

> **3290** Verbal Feedback Versus Verbal and Self Assessment Feedback for Pre-Professional Female Adolescent Dancers *Marisa Nicole Autera, SPT and Jennifer T. Gentile, PT, DPT*

**3291** Dynamic Balance Performance Predictors: Relative GRIP Strength, Dysfunctional Breathing, and Sex *Brent Alfred Harper, PT, DPT, DSc, Jason Funke, Austin Kang, SPT, Nicole Kielty, SPT, Don Tran, SPT, Casey Nobles Vogel, PT, DPT, Emmanuel Babatunde John, PT, DPT, MBA, MPH, PhD and Jacklyn Heino Brechter, PT, DPT, PhD* 

**3292** Dry Needling Use and Management of Chronic Ankle Instability in a Dancer: A Case Report *Amy Humphrey, PT, DPT* 

3293 Prevalence of Musculoskeletal Pain/Discomfort in Musical Ensemble Conductors: Associations with Personal and Environmental Characteristics *Gregory Francis Marchetti, PT, PhD and Caron Daley* 

**3294** Coping Mechanisms and Psychological Factors in Dancers

Elizabeth Lynn McAneny, SPT, Emma G. Massarelli, SPT, Isabella Raroque, SPT, Joan K. Heeringa, SPT, Lauren Dalal, SPT, Madison Witt, SPT, Naomi Shapira, SPT, ATC, Vera Menchikova, SPT and Laurel Daniels Abbruzzese, PT, EdD

**3295** <u>Video Assessment of Dancers and Non-Dancers - a</u> <u>Virtual Reliability Study</u>

*Marla McReynolds-Waldron, PT, DPT*, Amanda Kate Fox, PT, DPT and Laurel Daniels Abbruzzese, PT, EdD

**3296** Development of the Japanese Dance Functional Outcome Survey: Cross-Cultural Adaptation and Preliminary Validation Study

Yuriko Nabeta, PT, DPT, Mayumi Kuno-Mizumura and Shaw Bronner

3297 Effects of Abrupt Tempo Changes on Landing Mechanics during Repeated Jumps for Ballet Dancers *Natsuko Oshima, PT, DPT*, *Hui-Ting Goh, PT, PhD, Mark* D. Weber, PT, ATC, PhD and CHENG-Ju Hung, PT

3298 <u>Annual Wellness Screening of University Level Dancers Pre COVID-19 Compared to Post COVID-19</u> Sarah Jean Powner, PT, DPT and Marisa E. Hentis, PT, DPT

**3299** <u>Stinger Injury in a Collegiate Dancer: A Case Report</u> *Isabella Scangamor, PT, DPT, Sarah Elizabeth Edery-Altas, PT, DPT and Stephen Michael Kareha, PT, DPT, ATC, PhD* 

**3300** In Vivo Assessment of Dancers Weight-Bearing Barefoot and En Pointe Using a Multi-Segment Foot Model *Kimberly Perrella Veirs, PT, MPT, ATC, PhD, Josiah Rippetoe, Carol Pierce Dionne, PT, DPT, PhD, Jonathan D Baldwin and Lynn M. Jeffries, PT, DPT, PhD* 

3301 If You're Not Loading Your Dancers, What's the Pointe? Amanda Williamson, PT, DPT

### MEMBERSHIP COMMITTEE UPDATE Jessica Waters

Our formal PASIG membership roster has dropped to 686 members. Our closed PASIG Facebook numbers are up to 381 members. <u>https://www.facebook.com/groups/PT4PERFORM-ERS/</u>

Be sure to update your membership status on the Performing Arts SIG web page.

The demographics of our membership as of 10/14/22 are depicted below.

Show your PASIG pride! PASIG merchandise, featuring our new logo designed by Victoria Lu, is available for purchase by members on our AOPT website. The revenue generated will support PASIG strategic initiatives. Please note: limited sizes are available in the clothing options.





### EDUCATION COMMITTEE UPDATE VP, Melissa Strzelinski

In the summer of 2020, the PASIG formed an ISC Task Force led by Katrina Lee and Sarah Edery-Altas. They recruited authors, Emily Scherb, Dawn Muci, Heather Heineman, and Stephanie Greenspan to create a new Independent Study Course (ISC) on Circus Artists for the Academy of Orthopaedics.

Circus is a spectacular joy to watch. The lights and spectacle can highlight examples of extreme physical proficiency. However, the reality of working in the circus arts requires years of training, maintenance behind the scenes and great physical therapy care. Although the professional artist may be what immediately comes to mind, professional artists make up the minority of the circus artists who need care.

Circus as a recreational pastime has been exploding in the United States for the last 20 years with studios popping up all over the country to teach circus and aerial skills. In addition, dance schools are adding acrobatics, gymnastics gyms are adding aerial arts, and yoga studios are moving their practice off the ground and into the air. Circus arts seem to be everywhere and if you haven't seen an artist in your clinic yet, you will soon.

To work with the circus artist patient from novice to professional, a physical therapist should understand the demands of their training and of their specific disciplines. To help clinicians appreciate the circus world and the challenges that circus artists face at all levels we have developed an independent study course on circus arts.

### **Clinical Management of Circus Artists**

- Circus 101: Features and Feats of Circus Bodies
- Aerial Athletes: Flying, Hanging, Wrapping, Catching
- Equilibrium, Propulsion, Impact, and Control: Landing the Skills to Treat Ground Acrobats

This independent study course (ISC) provides a comprehensive review of circus arts in the United States and why an increasingly greater number of physical therapists may be called upon to evaluate and treat this growing population of artists. The authors discuss the various disciplines and apparatus used in circus arts, providing a background for the epidemiology and mechanism of injuries specific for various performers. The unique physical demands and characteristics of circus artists are discussed. A review of common circus injuries and associated risk factors, along with considerations of beliefs and conceptions artists have about injuries and health care, is also provided. In each monograph, the uniqueness of physical therapy care as it relates to the circus artists is highlighted. The course is complemented with extensive figures, videos, and case examples.

The new ISC can be found on the Academy of Orthopaedics website:

https://www.orthopt.org/content/education/independentstudy-courses

### OUTREACH COMMITTEE UPDATE Danielle Farzanegan

The Outreach Committee is working on a video project to demonstrate "What is Performing Arts Physical Therapy." To promote awareness about the role of performing arts physical therapist to consumers (artists) and arts companies/employers. This initiative falls within the AOPT strategic framework: **Positioning and Public Awareness** - Position members as experts in managing movement and functional performance impairments. Please contact Danielle if you are supporting Outreach initiatives.

### COMMUNICATIONS COMMITTEE UPDATE Dawn Muci

The Communications Committee will be working closely with AOPT to push our messages out through various social media accounts. Be sure to follow Twitter handle: @OrthopedicAPTA, Instagram handle: @APTA\_Orthopaedic, and Facebook: @PT4Performers.

### RESEARCH COMMITTEE UPDATE Michael Tsang

PASIG continues to produce <u>Citation Blasts</u> on a diverse array of topics that are sent directly to members and posted to the web. Thank you to the following authors for your contributions. This has been an excellent way for student physical therapists to contribute to the PASIG.

| August    | Compensated Turnout and Alignment of the Lower Body in<br>Dancers and its Relation to Injury | Charissa Chaban, PT, MPT, OCS, ATC, NCPT   |
|-----------|--|--|
| September | Prevalence of Eating Disorders and Body Dissatisfaction among Dancers                        | Belinda Le, SPT  |
| October   | Kinesiotaping for Performing Artists   | Emily Loftus, SPT  |
| November  | Achilles Tendon Disorders in Ballet Dancers  | Nicole Harry, SPT<br>Elizabeth Janowitz, SPT<br>Michelle Dolphin, PT, DPT, MS, OCS,<br>FAAOMPT |

### PERFORMING ARTS FELLOWSHIP UPDATE Tiffany Marruli

Congratulations to the Columbia University Irving Medical Center/West Side Dance Physical Therapy Performing Arts Fellowship which was accredited by the ABPTRFE in September 2022 after graduating its first fellow, Kendall Lynch in July 2022. We are fortunate to have four accredited Performing Arts Fellowship programs that offer a variety of opportunities for clinical practice, onsite coverage, and mentorship with performing artists.

A Performing Arts Fellowship is a great way to increase your knowledge and skill set for the management of performing arts patients. Fellowships are open to individuals who have completed an accredited physical therapy residency and/or a current specialist certification from the ABPTS. If you are interested in furthering your performing arts career, please contact the program directors below for more information regarding each program.

### Columbia University Irving Medical Center and West Side Dance Performing Arts Fellowship

- Program Director: Laurel Abbruzzese la110@cumc.columbia.edu
- https://www.ps.columbia.edu/education/ academic-programs/programs-physicaltherapy/performing-arts-fellowship

#### Harkness Center for Dance Injuries Performing Arts Fellowship

- Program Director: Angela Stolfi harkness@ nyulangone.org
- https://med.nyu.edu/departmentsinstitutes/orthopedic-surgery/specialtyprograms/harkness-center-dance-injuries/ education/professional-developmentstudents-healthcare-practitioners/ academic-observation-fellowship

### The Johns Hopkins Hospital Performing Arts Fellowship

- Program Director: Andrea Lasner danceFIT@jhmi.edu
- https://www.hopkinsmedicine.org/ physical\_medicine\_rehabilitation/

education\_training/therapy-residency/physical-therapy/ performing-arts-pt-fellowship.html

### The Ohio State University Wexner Medical Center Performing Arts Fellowship

- Program Director: Tiffany Marulli tiffany.marulli@osumc.edu
- https://hrs.osu.edu/academics/graduate-programs/clinical-doctorate-in-physical-therapy/residencies-and-fellowships/performing-arts

On behalf of the Performing Arts Special Interest Group (PASIG), AOPT

### **CLINICAL MANAGEMENT OF CIRCUS ARTISTS**

Independent Study Course 32.3

#### Description

This course provides a comprehensive review of circus arts in the United States and why an increasingly greater number of physical therapists may be called upon to evaluate and treat this growing population of artists. The authors discuss the various disciplines and apparatus used in circus arts, providing a background for the epidemiology and mechanism of injuries specific for various performers. The unique physical demands and characteristics of circus artists are discussed. A review of common circus injuries and associated risk factors, along with considerations of beliefs and conceptions artists have about injuries and health care, is also provided. In each monograph, the uniqueness of physical therapy care as it relates to the circus artists is highlighted. The course is complemented with extensive figures, videos, and case examples.

#### **Topics and Authors**

Circus 101: Features and Feats of Circus Bodies Emily Scherb, PT, DPT; Heather Heineman, PT, DPT, OCS, WCS; Dawn Muci PT DPT SCS ATC

Aerial Athletes: Flying, Hanging, Wrapping, Catching Emily Scherb, PT, DPT; Heather Heineman, PT, DPT, OCS, WCS

Equilibrium, Propulsion, Impact, and Control: Landing the Skills to Treat Ground Acrobats Dawn Muci, PT, DPT, SCS, ATC Stephanie Greenspan PT, DPT, OCS, NCS



Orthopaedic Practice volume 35 / number 1 / 2023

Learning Objectives

artist participation.

participation in circus arts.

management.

**Editorial Staff** 

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be able to:

Upon completion of this monograph series, the participant will

musculoskeletal demands and typical physical modifications

1. Describe the history and demographic trends of circus

3. Recognize various intrinsic and extrinsic factors that can

4. List common musculoskeletal conditions associated with

5. Design a post-injury rehabilitation plan that integrates the

different circus disciplines to assess physical readiness prior

to participation in or for return to training and performance.

For Registration Fees and Additional Questions,

circus artists' perceptions and needs into their injury

6. Select tests and measures relevant to the demands of

Editor-Guy G. Simoneau, PT, PhD, FAPTA

Managing Editor-Sharon Klinski

physical therapist in addressing these risk factors.

contribute to injury risk in circus artists and the role of a

2. Understand fundamental skills, apparatus, and

associated with participation in circus arts.



### FOOT & ANKLE ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY, APT

### **PRESIDENT'S MESSAGE**

Frank DiLiberto, PT, PhD

### **GREETINGS FASIG MEMBERS!**

Thank you to all of you who placed votes for the open Vice President and Nominating Committee member FASIG leadership positions. Results will be forthcoming, but a big thank you to Jeff Houck, PT, PhD for his service as Vice President, and to Ed Jones, PT, DHSc, OCS for his service as a Nominating Committee member, and most recently as the Chair who led the organization of the most recent slate of FASIG leadership candidates.

Our Combined Sections Meeting in San Diego, CA, is right around the corner and I hope to see many of you there. I would like to draw your attention to our membership meeting and excellent foot and ankle programming.

### FRIDAY, FEBRUARY 24<sup>TH</sup>

### 6:30 a.m. – 7:15 a.m. FASIG Membership Meeting

Come to network with your fellow foot and ankle physical therapists, hear an update on all FASIG initiatives, and potentially consider becoming more involved in moving foot and ankle care forward. Does it make it easier to wake up early if I say that we will have FASIG socks available? If you are unable to attend, we will host a virtual membership meeting shortly after CSM.

8:00a.m.–10:00a.m. (OR-14077) Educational Session: Person-Specific Care for Individuals with Foot and

### Ankle Dysfunction: A Roadmap Beyond Localized Tissue Damage 11:00a.m.–1:00p.m. (OR-14325) Tarsal Therapeutics: Remedies for Troubled Feet

We also have a stellar line up of foot and ankle platform presentations, most of which can be attended on Saturday, February 25, 11:00 a.m. - 1:00 p.m. (OR-15260 Orthopaedics Platform Session 7) and 3:00 p.m. - 5:00 p.m. (OR-15261 Orthopaedics Platform Session 8), in addition to poster presentations during the conference.

### **ADDITIONAL NEWS**

Be sure to check out the newest FASIG Infographic: Metatarsalgia (PT and Patient versions). Thank you to our Practice Chair, Ashley Waite PT, DPT and Stephanie Albin PT, DPT, PhD, OCS, FAAOMPT for leading this effort. Be on the lookout for additional Infographics, such as Achilles Tendinopathy, Athletic Footwear, and Foot Screening for people with diabetes mellitus, in the coming months. If you have an idea for an infographic or would like to help in generating one, please reach out to the FA SIG leadership.

Stay tuned for a new FASIG Quarterly Newsletter under the direction of our Student Mentorship Chair, Hayley Powell DPT, ATC, and her new student team members.

See you soon, Frank

#### Rehabilitation Considerations for the Pediatric and Adolescent Female Athlete Christy Zwolski, PT, DPT. PhD. OCS

### DID YOU Adolescent female athletes undergo M? many physical and physiological changes that can affect injury risk:

- Growth spurt
- Body weight gain
- Ossification of growth plates
- Accrual of bone mass
- Slowing of muscle mass accrual
- Increase in estrogen, growth
- hormone, and IGF-1
- Increased joint mobility

### Injury prevention strategies for young female athletes:

- Incorporate a proper warm-up and cool-down during practices and individual training sessions
- Include strength training and stretching within training program
- Wear properly fitted protective equipment, including helmets, pads, shoes, and mouth guards
- Do not increase training activity, load, mileage, or pace by more than 10% per week
- Training hours per week should not exceed age (ex: a 12-year-old female should not train more than 12 hours/week)
- Weekly organized sports hours to free play hours should not exceed 2:1
- Play different positions and sports throughout the year





### **PRESIDENT'S MESSAGE**

With kind regards from Nancy Robnett Durban, PT, MS, DPT

Hello all...I hope this report finds you well, safe and enjoying the holiday season. This report will provide brief updates. The highlight of this publication is the article that follows the reports titled, Clinical Identification of Neurobiological Pain Mechanisms – Rethinking Our Evaluation and Management of Musculoskeletal Pain by Andrew A. Post, DPT, Carol A. Courtney, PT, PhD, ATC, Josiah D. Sault, DPT, and Kathleen A. Sluka, PT, PhD, FAPTA.

### **President's Report:**

Our latest membership meeting was held virtually on September 7,2022 and is published for your viewing at: <u>https://</u><u>www.orthopt.org/content/special-interest-groups/pain/webinar-</u><u>series-podcasts</u>

Our next membership meeting will be virtual and held in January 2023 prior to CSM 2023. Please watch for your invitation to join.

### **PROJECTS**

#### • PainCast:

The latest PainCast was held on October 24, 2022. Maxi Miciak and Giacomo Rossettini discussed the therapeutic relationship. They both recently published a viewpoint piece in *JOSPT* titled, *Looking at Both Sides of the Coin: Addressing Rupture of the Therapeutic Relationship in Musculoskeletal Physical Therapy.* A great discussion occurred regarding how the therapeutic relationship impacts pain care. This PainCast was recorded and is posted on our AOPT Pain SIG site and Facebook page. PainCast initiatives are developed and coordinated by Vice President, Eric Kruger, PT, DPT, PhD. Please contact Eric if you have future topic suggestions. (EKruger@salud.unm.edu) https://www.orthopt.org/content/special-interest-groups/pain/ webinar-series-podcasts

### • Clinical Pearls:

The latest Clinical Pearl was published October 2022 titled, Pain Mechanism Classification Clinical Pearl Part 2: Nociceptive pain. This Clinical Pearl was provided by Benjamin Davis, PT, DPT.

The Clinical Pearls team is organized by Research Chair, Adam Rufa, PT, DPT, PhD (<u>RufaA@upstate.edu</u>). <u>https://www.orthopt.org/content/special-interest-groups/pain/clinical-pearls</u>

### • Research Review:

The Research Reviews are organized by Research Chair, Adam Rufa, PT, DPT, PhD (<u>RufaA@upstate.edu</u>). Our latest Research Review published November 14, 2022, was titled, Cesarean section delivery pain. This Research Review was provided by Deborah B. Riczo, PT, MEd, DPT and is published on our SIG website at <u>Research: Abstracts, Articles, and Reviews - Academy</u> of Orthopaedic Physical Therapy (AOPT) (orthopt.org).

### • Elections:

Election results for President and Nominating Committee member will be announced by the Academy in December. It is not too early to be thinking of 2023. In 2023, the SIG will be slating candidates for Vice President of Education and the Nominating Committee. For your information, each year we slate candidates for the Nominating Committee. The term is 3 years. The first 2 years are served as Nominating Committee member and the last year of their term they serve as the Committee Chair.

**President's message closing...** The Pain SIG would like to thank the AOPT staff, President, Bob Rowe, PT, DPT, DMT, MHS and Director/ SIG advisor Beth Collier, PT, DPT, OCS for their continued support and guidance.

We presently have multiple opportunities for SIG involvement on the membership, research, practice, and public relations committees. Please contact me (<u>ndurban@orthopt.org</u>) or any other Pain SIG leader to volunteer to help our initiatives and our future. <u>https://www.orthopt.org/content/special-interest-groups/pain</u>

It is now my privilege to introduce the authors of our feature article titled, Clinical Identification of Neurobiological Pain Mechanisms – Rethinking Our Evaluation and Management of Musculoskeletal Pain

### **AUTHORS:**

### Andrew A. Post, PT, DPT (University of Iowa)

Andrew Post is a PhD student at the University of Iowa. His research currently investigates non-pharmacological treatment approaches for chronic musculoskeletal pain conditions including fibromyalgia and management of persistent Achilles tendon pain with a biopsychosocial approach.

### Kathleen Anne Sluka, PT, PhD, FAPTA (University of Iowa)

Dr. Sluka is a professor in the Department of Physical Therapy and Rehabilitation Science at the University of Iowa. Dr. Sluka's research focuses on the neurobiology of musculoskeletal pain as well as the mechanisms and effectiveness of non-pharmacological pain treatments commonly used by physical therapists. She has published over 180 peer-reviewed manuscripts, numerous book chapters, and a textbook on Pain Mechanisms and Management for the Physical Therapist.

### Carol Ann Courtney, PT, ATC, PhD (Northwestern University)

Carol A. Courtney is a professor at Northwestern University Department of Physical Therapy and Human Movement Science. Dr. Courtney has clinical expertise in the management chronic musculoskeletal pain and sports injury. Her research investigates

PAIN

the effects of knee joint injury and osteoarthritis on pain processing and joint function, as well as modulation of pain mechanisms through non-pharmacologic interventions, including manual therapy and exercise.

### Josiah Sault, PT, DPT

Josiah Sault is a physical therapist with 12 years of clinical experience in an urban setting. He has published several peer reviewed papers including case reports and systematic reviews primarily focusing on the management of chronic pain conditions.

### CLINICAL IDENTIFICATION OF NEUROBIOLOGICAL PAIN MECHANISMS - RETHINKING OUR EVALUATION AND MANAGEMENT OF MUSCULOSKELETAL PAIN

Andrew A. Post, DPT,<sup>1</sup> Carol A. Courtney, PT, PhD, ATC,<sup>2</sup> Josiah D. Sault, DPT,<sup>3</sup> Kathleen A. Sluka, PT, PhD, FAPTA<sup>1</sup>

<sup>1</sup>Department of Physical Therapy and Rehabilitation Science, The University of Iowa, Iowa City, IA

<sup>2</sup>Department of Physical Therapy and Human Movement Science, Northwestern University, Chicago, IL

<sup>3</sup>Department of Physical Therapy, University of Illinois Hospital and Health Sciences System, Chicago, IL

### PAIN OVERVIEW AND BURDEN OF PAIN

The International Association for the Study of Pain (IASP) recently revised their definition of Pain as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage".<sup>1</sup> Globally, pain is the leading cause of disability and is the number one reason patients seek out health care within the United States.<sup>2,3</sup> In the United States alone, it is estimated that 560 to 635 billion dollars is lost annually due to costs associated with health care utilization for pain management, reduced work productivity, and disability payments, which exceeds medical expenses for cardiovascular disease, cancer, and diabetes.<sup>3-5</sup> Poorly managed pain does not just limit an individual's physical function but may also negatively impact aspects of their life that are less visible including their emotional well-being and overall quality of life.<sup>5</sup>

Pain is frequently sub-grouped by the duration that an individual has experienced symptoms. Acute pain, or pain immediately following tissue damage or injury, is believed to be an adaptive response to a potentially damaging stimulus that provides a protective response to allow for the healing of the underlying cause of pain.<sup>6,7</sup> A portion of those with acute pain will go on to develop chronic pain, or pain that does not serve an adaptive purpose where the duration extends beyond the expected time of tissue healing.<sup>7</sup> Additionally, for those who develop chronic pain, some will experience substantial restrictions in their ability to participate in work duties, social and recreational activities, and selfcare, which has been termed "high-impact chronic pain" by the National Pain Strategy.<sup>8</sup>

The purpose of this AOPT newsletter is to articulate the complex nature of pain that extends beyond the appraisal of pain based solely on the duration of symptoms and towards an appreciation of a patient's individual pain experience that includes

the synergistic relationship between the biologic, psychological, and social components of pain. We detail why the assessment of underlying neurobiological pain mechanisms as part of a patient evaluation is beneficial for physical therapists, what the three neurobiological mechanisms of pain are, and finally a brief description on when and how clinicians can assess for these underlying pain mechanisms. Greater detail of these topics will be presented at the American Physical Therapy Association (APTA) Combined Sections Meeting 2023 by the authors of the newsletter.

### Why Should Physical Therapists Assess for Neurobiological Mechanisms of Pain?

Pain is often viewed as a single entity, leading to wide variability in the assessment and ultimately treatment by health care providers.<sup>5</sup> Historically, management of painful conditions embraced a biomedical model. This model utilized pathological findings within peripheral tissues to direct interventions secondary to an underlying assumption that pathology is necessary for the symptoms experienced.9 However, the biomedical model failed to take into account the variability between individual patients while lumping those with pain into single diagnoses, ultimately, impeding upon the individualization of patient care. Furthermore, there continues to be a lack of evidence supporting the direct association between pathology found on imaging studies and patient reports of clinical pain and symptoms for a wide range of musculoskeletal diagnoses.9-14 The more modern trend towards personalized and precision medicine has shifted the focus towards a more encompassing biopsychosocial model of care that highlights interactions between neurobiological pain pathways, psychosocial factors (risk/vulnerability and resiliency/ protective), and movement impairments (Figure 1).<sup>6,15</sup> Use of a biopsychosocial approach within the physical therapy profession for pain management allows for the appraisal of an individual's pain experience that is often multidimensional, ultimately enhancing clinical care and patient outcomes.<sup>16</sup>

### Opportunity for the Physical Therapy Profession to Enhance the Management of Musculoskeletal Pain

Historically, pharmacological interventions have been prescribed to patients to match the underlying pain mechanism (eg, gabapentinoids for neuropathic pain and nonsteroidal antiinflammatory drugs (NSAIDs) for primarily nociceptive pain related to structural changes<sup>6</sup>). Recently, increasing evidence and recommendations, including CDC guidelines, have moved pain management away from pharmacological interventions and shifted towards exercise and patient education as first-line treatments for the management of persistent pain conditions.<sup>17,18</sup> In 2021, the APTA released an updated White Paper on the role of the Physical Therapy profession in the management of chronic pain and how the profession is well suited to combat overuse of pharmacological interventions including opioids.7 Similar to pharmacological approaches to pain management, physical therapists have the ability to clinically identify pain mechanisms and select interventions tailored to the individual patient to address the underlying mechanism. Determining the underlying pathophysiology of the nociceptive pathways is, in ways, equivalent to making a 'pain diagnosis,' and diagnosis, by definition, should direct treatment. One of the first lines of management by the orthopaedic physical therapist will include interventions such as





<sup>a</sup>Reprinted with permission from Chimenti RL, Frey-Law LA, Sluka KA. A mechanism-based approach to physical therapist management of pain. *Phys Ther.* 2018;98(5):302-314 by permission of Oxford University Press.

exercise and manual therapy to manage impairments associated with the condition.<sup>19</sup> For example, a patient who's pain is primarily due to hyperexcitability of the central nervous system (CNS) including diagnoses such as fibromyalgia, may benefit from interventions including activity pacing, aerobic exercise, or transcutaneous electrical nerve stimulation (TENS) that has been shown to activate central endogenous inhibitory mechanisms.<sup>20-22</sup> Conversely, for a patient with an acute inversion ankle sprain, peripherally directed interventions including manual therapy to the talocrural joint or ankle specific therapeutic exercise may be employed to decrease nociceptive pain for the promotion of movement and localized tissue healing.<sup>23</sup>

Enhanced awareness of the benefits of exercise and physical activity as first-line treatment to address chronic pain has also permeated into entry-level Doctor of Physical Therapy (DPT) programs. With the idea to advance entry-level clinician preparedness for patient care and as direct-access providers, there has been an emphasis to include content within DPT curriculums pertaining specifically to pain assessment and management.<sup>24,25</sup> In 2014, Hoeger Bement et al described the application of the Core Competencies of Pain Management into DPT curriculum to allow entry-level physical therapists the necessary knowledge to manage a patient's pain.<sup>16,26</sup> Later in 2021, Shepherd et al published the Pain Education Manual through the APTA Academy of Orthopaedic Physical Therapy with the goal of facilitating the progression of DPT programs to incorporate our current understanding of pain and the implications for clinical practice at the entry-level.<sup>25</sup> With direct access to physical therapy now in all 50 states and with high-level evidence to support non-pharmacological interventions as a first-line treatment for persistent pain, the physical therapy profession is uniquely positioned as primary care providers for pain management within a multidimensional healthcare team.<sup>7,16</sup>

#### What are the different neurobiological mechanisms of pain?

Five underlying mechanisms of pain have recently been highlighted.<sup>5,6,15</sup> While more than one type of pain often contributes to an individual's pain experience, clinical identification of underlying pain mechanisms can assist clinical decision-making for the selection of interventions.<sup>5,15,27</sup> The remainder of this section will describe each mechanism and clinical features to enhance assessment by physical therapists and inform clinical reasoning for treatment approaches (**Figure 2**).

<u>Nociceptive</u>: Nociceptive pain is pain that arises from actual or threated damage to non-neural tissue and is due to the activation of nociceptors.<sup>28</sup> Tissue damage often does not involve the central or peripheral nervous system and is often the predominant pain mechanism is diagnoses including osteoarthritis (OA) and tendinopathies.<sup>5,6</sup> Prolonged nociceptive pain from injured tissue may result in release of chemical substances including neuropeptides (Substance P, calcitonin gene-related peptide), prostaglandins, and cytokines that can decrease the threshold for neuronal activation and enhance nociceptor firing rate, resulting in a phenomenon often referred to as peripheral sensitization.<sup>5,6</sup>

<u>Neuropathic</u>: Neuropathic pain is caused by a lesion or disease of the somatosensory nervous system.<sup>28</sup> This may present clinically as focal symptoms after direct insult to a nerve or more generalized due to a metabolic cause such as diabetes or chemotherapy induced peripheral neuropathy.<sup>29</sup> These lesions result in altered and disordered neuronal afferent signal transmission from the periphery into the spinal cord and brain.<sup>29</sup>

<u>Nociplastic</u>: Nociplastic pain arises from altered nociception despite no clear evidence of actual or threatened tissue damage causing the activation of peripheral nociceptors or evidence for disease or lesion of the somatosensory system causing the pain.<sup>28</sup> Nociplastic pain is different from the term "central sensitization". Nociplastic pain is used to describe a clinical pain presentation for individuals with widespread hypersensitivity that may be disproportionate or not associated with pathology. Diagnoses such as fibromyalgia, temporal mandibular disorder, and phantom

**Figure 2.** Neurobiological Pain Mechanisms, Associated Physiological Processes, and Common Diagnoses<sup>a</sup>

| Nociceptive  | Nociplastic  | Neuropathic  |
|--|--|--|
| •Due to activation<br>of nociceptors<br>•Inflammation<br>•Mechanical<br>irritant | •Due to disturbance in<br>central pain<br>processing<br>•↑excitability<br>•♥inhibition | •Due to lesion or<br>disease of the<br>somatosensory<br>system |
| ·Injury  | •Examples  | •Examples<br>•Diabetic neuropathy                              |
| •Examples  | ·Fibromyalgia  | ·Carpal tunnel   |
| •Osteoarthritis  | <ul> <li>Temporomandibular</li> </ul>  | syndrome   |
| <ul> <li>Ankle sprain</li> </ul>   | disorder   | complex regional pain  |
| ·Rheumatoid  | <ul> <li>Nonspecific low back</li> </ul>   | syndiome   |
| arthritis  | pain   |  |

<sup>a</sup>Reprinted with permission from Chimenti RL, Frey-Law LA, Sluka KA. A mechanism-based approach to physical therapist management of pain. *Phys Ther.* 2018;98(5):302-314 by permission of Oxford University Press.

limb pain have been described as nociplastic pain conditions and thought to share common neurobiological mechanisms.<sup>27,30</sup> Central sensitization is a term used to describe a myriad of underlying central neuronal physiologic changes that result in a heightened pain state.

Psychosocial: Adoption of the biopsychosocial understanding of pain has allowed for an enhanced appreciation of the multidimensional interactions between biological and psychosocial factors that influence one another and ultimately impact a patient's pain experience, however, in clinical practice, psychological factors are frequently viewed as secondary and reactive to pain.<sup>31</sup> There is a bidirectional relationship between the biological pain mechanisms (nociceptive, neuropathic, nociplastic) and psychological variables, where negative psychological characteristics including depression and catastrophizing have been reported as predictive in the transition from acute to chronic pain.<sup>31,32</sup> Therefore, Edwards et al have stated that given the synergistic relationship of pain and psychology, applying appropriate treatments to the underlying neurobiological pain mechanism may positively impact psychologically factors, while directly addressing maladaptive psychological factors can enhance treatment effectiveness in producing analgesia.31,33,34

Movement system: The Movement System is defined as the collection of systems (cardiovascular, pulmonary, endocrine, integumentary, nervous, and musculoskeletal) that interact to move the body or its component parts.<sup>35</sup> Physical therapists are trained in the evaluation, diagnosis, and treatment of impairments of the movement system.<sup>36</sup> Pain can result in muscle inhibition or facilitation, alterations to mechanical behavior to protect against further pain, and fear-avoidance, ultimately resulting in movement impairments.<sup>37</sup> Prolonged movement dysfunctional movement can result in alterations in loading, decreased variability in movement, and reduced overall movement.37 According to Chimenti et al, integration of the physical therapy profession's expertise of the movement system while incorporating neurobiological pain mechanisms in patient evaluations allows for optimal patient assessment and development of individualized treatment of painful conditions.15

### When and How Can Physical Therapists Assess Neurobiological Mechanisms of Pain?

The comprehensive evaluation of patients to assess underlying pain mechanisms is completed through the patient's history, physical examination, and standardized assessment instruments.9 Research that evaluate for nociceptive, neuropathic, and nociplastic pain in a laboratory setting often use specialized equipment to complete quantitative sensory testing (QST) that may result in clinicians feeling at a disadvantage with their own patients due to a perceived lack of equipment or resources. However, use of sophisticated instruments or procedures may not always be necessary to identify underlying neurobiological pain mechanisms. The following section will highlight items that physical therapists may already be completing that can assist with the identification of neurobiological pain mechanisms, but with slight modifications in the interpretation to assist clinical reasoning and aid in the development of a clearer picture of the of the unique pain experience of each patient that comes into the clinic.

Subjective Examination: Secondary to the potential lack of association between pathological findings on imaging and clinical symptoms, the patient history provided during an initial evaluation is essential in establishing the underlying cause of a patient's symptoms.9 Additionally, the subjective examination provides clinicians with an opportunity to assess for psychosocial factors that may also play a role in an individual pain experience.<sup>31</sup> Specific to the pain description, patient reports of the location of pain, duration of symptoms, and the adjectives used to describe their symptoms can assist with clinical differentiation of the underlying pain mechanisms (Figure 3). Pain that is reported to be localized at a single area and has an acute timeframe is more likely to be nociceptive in nature.<sup>15</sup> Patient reports of electric, shock-like, lancinating, burning, tingling, or numbing symptoms that radiate into adjacent body regions may be more neuropathic.<sup>5,6,15</sup> Finally, disproportionate pain and symptoms in multiple body regions of greater duration may be due to nociplastic pain.<sup>6,15</sup> The completion of a body diagram either by the patient or clinician can further assist hypothesis generation and differentiation of the patient's underlying pain mechanism by providing clinicians with a visual representation of the patient's pain distribution. Furthermore, the patient's medical history including comorbidities, prior history of trauma, or hypersensitivity to non-noxious stimuli including sounds and/or light may further assist with establishing a nociplastic component to the patient's pain presentation.<sup>5,27,38</sup> Diagnoses including fibromyalgia, irritable bowel syndrome, temporomandibular joint disease, and chronic fatigue that are described as nociplastic pain conditions are thought to share a common pathogenesis and often share features including diffuse pain in multiple region of the body, sleep disturbance, fatigue,

**Figure 3.** Patient Subjective Reports of Pain and Common Adjectives Associated With Nociceptive, Neuropathic, and Nociplastic Pain Neurobiological Mechanisms<sup>a</sup>

| Nociceptive   | Neuropathic   | Nociplastic   |  |  |
|---|---|---|--|--|
| Pain  | Pain  | Pain  |  |  |
| <ul> <li>Sore</li> <li>Throbbing</li> <li>Dull</li> <li>Tender</li> <li>Aching</li> <li>Cramping</li> </ul> | <ul> <li>Hot</li> <li>Burning</li> <li>Electric<br/>shocks</li> <li>Stabbing</li> <li>Painful cold</li> <li>Tingling</li> <li>Prickling</li> <li>Numbness</li> <li>Pins and<br/>needles</li> <li>Allodynia</li> <li>Hyperalgesia</li> </ul> | <ul> <li>Widespread pain<br/>and neuropathic<br/>pain qualities<br/>(allodynia and<br/>hyperalgesia)</li> <li>Fatigue</li> <li>Nonrestorative<br/>sleep</li> <li>Cognitive dysfunc-<br/>tion</li> <li>Mood disturbances</li> <li>Hypersensitivity<br/>to sensory input<br/>including bright<br/>lights, loud noises,<br/>and odors</li> </ul> |  |  |

<sup>a</sup>Adapted from Stanos S, Brodsky M, Argoff C, et al. Rethinking chronic pain in a primary care setting. *Postgrad Med.* 2019;128(5):502-515.<sup>5</sup>

difficulty with memory, family history of persistent pain, and sensory hypersensitivity.<sup>5</sup>

#### Questionnaires

Numerous validated and standardized pain-specific patientreported questionnaires that can assist clinicians with pain mechanism differentiation are available online free of charge. For example, the painDETECT is a 9-item questionnaire to assist with differentiation of neuropathic and nociceptive pain.<sup>39</sup> The Michigan Body Map and Revised Fibromyalgia Impact Questionnaire can assist with the differentiation between nociplastic and nociceptive pain.<sup>40</sup> Physical therapists may also screen for psychosocial factors based on the patient's history. Completion of patient-reported outcomes measures for psychological variables may include the Tampa Scale of Kinesiophobia 17-item questionnaire<sup>41</sup> (kinesiophobia), Pain Catastrophizing Scale 13-item questionnaire<sup>42</sup> (pain catastrophizing), the Generalized Anxiety Disorder 7-item questionnaire (anxiety), or Patient Health Questionnaire 2-item screen<sup>43</sup> (depression) and may inform the need employ a multidisciplinary team including a psychologist and biopsychosocial approach to physical therapy care.7,15

#### **Physical Examination**

Currently, the direct measurement of neurobiological pain mechanisms during a patient's physical examination is not feasible. Instead, indirect assessment and sum of the whole patient evaluation can assist with informing clinical decision-making.<sup>15</sup> Quantitative sensory testing measures may assist clinicians with identifying heightened CNS excitability through temporal summation of a repetitive stimulation (eg, von Frey monofilaments),<sup>44</sup> pain pressure thresholds (PPTs), application of a thermal stimulus, and reduced endogenous inhibition during conditioned pain modulation (CPM).<sup>45</sup> However, there are limitations to the completion of QST that include the lack of normative values and standardize protocols for measurement, ultimately reducing interpretation.<sup>15,46</sup> Further research in these areas will assist in enhancing the clinical utility of these physical assessment measures.<sup>46</sup>

### CONCLUSION

The physical therapy profession is well positioned to take on the challenge of identifying and differentiating underlying neurobiological mechanisms of pain for the patients we see every day in the clinic. Physical therapists are trained to assess pain, evaluate the impact of pain on function and quality of life, and examine for individual risk factors to manage and prevent the onset of chronic pain.7 While our understanding of pain has extended beyond recognizing pathology on an image, the physical therapy profession will continue to progress in our evaluation and management of pain as our understanding of the neurobiology of pain and clinical assessments advance.<sup>15</sup> Incorporation of a mechanism-based approach to pain management overlaid onto our expertise of the movement system will assist clinicians in the selection of more individualized interventions and development of a plan of care that includes a biopsychosocial understanding and appreciation of the patient as a whole and the entirety of their pain experience.

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#### **PRESIDENT'S MESSAGE**

Bruno U.K. Steiner, PT, DPT, LMT, RMSK

Life moves along quickly as has the year 2022. For some odd reason, in the past year, I have adopted the phrase, "don't blink" or you'll miss it. To that point, my initial year as I-SIG President has been intensely engaging and gratifying. Since this is the time of reflection and reaching out to one another, I have much to be thankful for. I will try spare you from a boilerplate 'attitude of gratitude' platitude, but I would like to remind our membership that we are blessed to be in a profession with such an impact on public health on both a far-reaching macro and individual level, and I can't help to feel we are at the very infancy of our potential. Here goes.

I am thankful for the participation of incredibly talented, thoughtful, passionate and intelligent Physical Therapy practitioners, academics, advocates and standard bearers who zealously, selflessly promote the potential of our beloved profession. I am thankful for all the physical therapists who teach and practice with compassion to represent and leverage our potential. I am thankful for those among our rank and file who, despite adversity, fatigue and resistance, unfailingly stick to the mission of improved health policy to offer our patients the best, compassionate, expedient care available. I am thankful for the brilliant, scientifically rigorous physical therapists who move toward adopting evaluative and treatment technology and methodology to keep our profession relevant and current with our patient population's realities and needs. I am grateful to physical therapists who challenge the status quo and who educate the public, state board members, and stakeholders that our profession has evolved to a doctoral level education, and that laws and rulings must reflect this current reality. This is the mission of the Imaging SIG and I am humbled by the brilliant members of the physical therapy profession.

### Our Fall 2022 I-SIG Membership Meeting: Engaging Change for PT-Imaging Referral on Multiple Fronts

Speaking of which, the Imaging SIG has concluded an intensive membership meeting with a phenomenal panel of speakers and participants titled, *Engaging Change for PT-Imaging Referral on Multiple Fronts* on November 17, 2022. If you missed it, not to worry, it is recorded, and it is a MUST listen or view. I am so impressed by the breadth and depth of knowledge of our panelists, and I am certain you will get a much deeper appreciation of the mission ahead. I never cease to learn from these experts. Remember, knowledge is a crucial component to strategic preparation.

Our first panelist and newly minted RMSK, James Dauber, PT, DPT, RMSK, CertMDT, CMTPT, presented '*Mind your Language – Calibrating your Questions to Generate a Favorable Response: The West Virginia Experience*'. In this presentation, James reflects on West Virginia's successful approach to elicit a ruling that reflects the capabilities of the primary care physical therapist. In a ground-breaking 2021 ruling, the West Virginia Board of Physical Therapy wisely issued a written opinion, advisory in

nature, that physical therapists may refer a patient to a radiologist (eg, order imaging), with clinical justification, for any diagnostic imaging study within the recognized standards of the practice and education for a physical therapist. Language and the narrative we craft is everything as James discusses this critical example of success in West Virginia.

Lance Mabry, PT, DPT, OCS, FAAOMPT reported on his seminal work, 'Physical Therapists Are Routinely Performing the Requisite Skills to Directly Refer for Musculoskeletal Imaging: An Observational Study,' which was just published by the Journal of Manual and Manipulative Therapy. I believe this publication is a critical piece of evidence supporting physical therapy imaging referral. No shock to us all that physical therapists are great at initiating appropriate imaging referrals, but Dr. Mabry shows us how overwhelming the evidence supports our profession. We discussed whether primary care physicians or non-physicians such as nurse practitioners, physician assistants, and clinical psychologists are ever evaluated to such scrutiny. If anyone has insights, please let us know! I think this speaks to an important point. We may benefit from comparisons to other professions who are granted imaging privileges to expose inconsistencies in health policy. We need to compare our educational hours in MSK-related evaluation, diagnosis, radiology, etc, to other disciplines that manage to safeguard their imaging privileges.

Evan Nelson, PT, DPT, PhD followed up with his recently published research in his talk 'After Legislative Authorization: Implementing Imaging Referral Processes in PT Practice.' Dr. Nelson continues to pile on with more compelling evidence that physical therapists order imaging responsibly and appropriately. Exciting indeed!

As for our final speaker of the evening, we were delighted to welcome APTA Arizona Chapter President, Brian Schmitz PT, DPT with 'Fight!...for your Right!...to Practice at the Top of your License!'. Dr. Schmitz led Arizona's Imaging Referral Legislative Initiative. He recounted his travails and tribulations in wrestling with the Arizona legislature to codify radiography referrals. There was much to unpack from this session, and I can't stress how much one can glean from this. Dr. Schmitz is a sharp, thoughtful, and passionate advocate who faced an unfavorable board ruling and an adversarial stakeholder who stopped us from having full access to all imaging modalities. Dr. Schmitz is undeterred and is continuing his quest for full access. I have the luxury to question the Arizona board ruling's response, and I must say (my impressions) I think the board missed a great opportunity, and as umpires have done repeatedly before them, they blew the call.

Regarding the recalcitrant stakeholder, who happened to be an ER physician, we can imagine how that went. Due to antiquated, calcified, and uninformed preconceptions, our doctoral level of expertise and education was NOT recognized nor fully appreciated. I can empathize with Dr. Schmitz only too well. In interviews with physicians I have worked alongside, and from whom I now enjoy the respect as a valued peer, they admitted that they had no idea that our education and experience were that rich. They thought our job was relegated to getting people out of bed after surgery. The onus is on us to craft a strategy to meet this entrenched attitude. We have to devise stratagems to defuse these attitudes and false belief systems. Language is everything, and we must develop a script to address this scenario. Maybe even a workshop is warranted, as we will face this recalcitrance repeatedly. We will explore this in subsequent webinars/webcasts. Channeling my inner broken record player - we want it all: MRI, CT-scan, DEXA, MSKUS, and radiography.

Adding to the thoughtful discussion, we heard from our Vice President, Brian Young, PT, DSc, OCS, FAAOMT and our Research Chair, George Benneck, PT, PhD, OCS. I added some legislative news and thoughts about the importance of PT-administered MSKUS! Do I need to tell everyone once again that MSKUS is the future of our profession and will erode more barriers to imaging referral... and more??

#### About that MSKUS exam...!!

I am proud to announce that another wave of 11 brave physical therapists has hazarded to sit the RMSK exam in the fall of 2022! I am waiting with bated breath. It takes 60 days for the results to come in. I have spoken with a few of our candidates, and they report the expected response. It's tough! It is designed to be challenging as it is the physician's exam. Physicians fail this exam in impressive numbers as well. So, you cannot be cocky about your prep, but being dedicated scientists and practitioners, we pass this exam. Let me reiterate, if you want to show that we rival the diagnostic acumen of other diagnostic professions, this is a compelling way to do it. My dear physical therapist colleagues, we need to take advantage of this opportunity, and we need MORE body count to (1) study this excellent imaging modality, (2) use it, (3) study for the RMSK exam... and (4) pass it! Let's make MSKUS our own!

#### Legislative Gains in PT Imaging Referral

North Dakota's practice act, revised in 2021, permits physical therapists to order x-rays.

Arizona Senate Bill 1312 was passed in 2022. This legislation permits physical therapists to order x-rays. The physical therapist ordering the x-rays must report the results to the patient's health care practitioner of record.

West Virginia Board of Physical Therapy Advisory Opinion: In 2021, the West Virginia Board of Physical Therapy issued a written opinion, advisory in nature, that physical therapists may refer a patient to a radiologist (eg, order imaging), with clinical justification, for any diagnostic imaging study within the recognized standards of the practice and education for a physical therapist.

#### In Pursuit? – More States Contemplating PT-directed Imaging Referral

Before listing states that may be deliberating physical therapist imaging referral strategy, I implore anyone who may be along the path to coordinate with the I-SIG. I hope members from all states who wish to go down that path consult with us to help with their negotiation prep and strategic planning! Call us and let us know. You don't have to reinvent the wheel on this. Let us help you...we would love to collaborate with you and, at the very least, provide you with some resources and insights to improve our collective chances as we chip away at the obstacles ahead. We will learn together and pass on the knowledge for the benefit of all patients. Good fortunes to all who go down that path: Connecticut – Decision not made as to whether to pursue next year. They are deliberating board opinion, regulation, or leg-islation

Georgia – Pursuing legislation to pursue full imaging and MSKUS Iowa – Pursuing legislation

Kentucky - may be sought in the following year

North Carolina – contemplating board opinion, regulation, or legislation

### **Recommended Webcasts and Podcasts**

There are 3 essential interviews I want to feature:

First, Joe Tatta, PT, DPT takes a deep dive with Dr. Lance Mabry in *The Latest Evidence on Physical Therapists Ordering Diagnostic Imaging with Lance Mabry* <u>https://www.youtube.com/watch?v=5Z35E4iYlgQ</u>

Second, please check our Stephen Shaffer, PT, ScD, FCAMPT, FAAOMPT in his podcast interview with Dr. Lance Mabry https://aaomptpodcast.simplecast.com/episodes/ep-100-mabry-interview

Third, I would like to highlight Dr. Shaffer's interview with former I-SIG President, Charles Hazle PT, PhD

https://aaomptpodcast.simplecast.com/episodes/rebroadcast-ep-28-hazle-interview

### FROM THE DESK OF OUR RESEARCH CHAIR – George Benneck, PT, PhD, OCS

The Imaging SIG Research Committee workgroup consisting of Alycia Markowski, Maureen Watkins, Murray Maitland, Robert Manske, Katherine Podoll, and Lorna Hayward recently published a paper in *Physiotherapy Theory and Practice* titled, *Exploring the integration of diagnostic musculoskeletal ultrasound imaging into clinical practice by physical therapists.* This longitudinal study examined significant cases during the weekly use of musculoskeletal ultrasound imaging by RMSK-certified physical therapists and illuminated the clinical reasoning behind the use of this technology in mainstream physical therapy practice.

### FROM THE DESK OF OUR VICE PRESIDENT – Brian Young, PT, DSc, OCS, FAAOMT

To support the requirements of CAPTE and ABPTRFE programs to teach components of diagnostic imaging and provide opportunities for all clinicians to enhance clinical skills, the Imaging SIG is excited to announce several educational opportunities being provided by members at CSM 2023! Please share these with all your Orthopaedic Academy and non-Orthopaedic Academy colleagues, as imaging skills are essential for every Physical Therapist!

Be sure to check out the **three 1-day preconference courses** that address Diagnostic Imaging:

- Tuesday, February 21: "Point-of-Care Musculoskeletal *Ultrasound: An Introduction and Hands-on Course.*" This is an excellent opportunity to learn about all a Physical Therapist can do with ultrasound and the RMSK certification.
- Wednesday, February 22: "Getting a Clear View of Imaging Content in Physical Therapist Educational Curricula" with Charles Hazle, Michael Ross, Lynn McKinnis, Aimee Klein, and Dale Gerke. This preconference course, sponsored by the

I-SIG, is an excellent resource for clinical and academic faculty across the spectrum of physical therapist education.

Wednesday, February 22: "Kick-starting your Diagnostic Imaging Skill Set for Lower Extremity Injuries in Direct Access Physical Therapy" with John Mason, Michael Crowell, Michael Johnson, and John McGinniss. This course will assist practitioners in developing decisionmaking skills for ordering, interpreting, and integrating diagnostic imaging into physical therapist practice.

Additionally, be sure to invite all your CSM colleagues and new acquaintances to our Saturday, February 25, 11 a.m. - 1 p.m. session, Imaging Masterclass: A Case-Based Learning Experience with Physical Therapist Imaging Experts with Drs Scott Tauferner, Stephen Kareha, Cindy Bailey, Peter Aguero, and Brian Young. Employing imaging-related skills can seem intimidating. This session will provide interactivity with imaging experts as they walk through clinical decision-making case examples, showing the integration of clinical examination, communication, ordering, interpretation, and integration into client care decisions.

> I look forward to seeing each of you at CSM! Brian

**A Quick Hitter and** IT IS FREE to AOPT members

DIAGNOSTIC **REFERRAL FOR IMAGING: Clinical Decision** Resources

> Available at www.orthopt.org

ACADEMY OF **ORTHOPAEDIC** PHYSICAL THERAPY ISC 32.2, The Female Athlete Throughout the Lifespan **Changes During Pregnancy** By Rita Deering and **Physiological** Shefali Mathur Christopher Increased: Posture Blood plasma volume End-diastolic volume Center of gravity Cardiac output more anterior **Resting HR**  Decreased static Coagulation stability Oxygen consumption Increased spinal Metabolic rate curvature Partial pressure of oxygen • Anterior pelvic tilt Ligamentous laxity Scapular protraction Relaxin Knee hyperextension Inter-recti distance Ankle dorsiflexion Blood glucose levels

### Decreased stride length

- Increased step width
- Reduced gait velocity
- Decreased single-limb support time
- Shorter swing phase
- Hip:
  - Decreased peak flexion, peak extension, and abduction
  - Increased peak external rotation, peak internal rotation, and adduction
- Knee: increased flexion and decreased extension
- Ankle: increased inversion and eversion
- Foot: increased external rotation

### **Contraindications to Exercise During** Pregnancy

| Relative Contraindications                        | Ruptured membranes  |  |
|---|---|--|
| to Exercise During Pregnancy                      | Heart disease that prohibits strenuous exercise   |  |
| Mild, well-controlled congenital heart conditions | Severe cardiac arrhythmias<br>Placental abruption<br>Severe respiratory conditions<br>Significant umbilical cord pathology (eg, vasa<br>previa) |  |
| Mild preeclampsia                                 |   |  |
| Thyroid disease that is not medically managed     |   |  |
| Type I diabetes that is well controlled           |   |  |
| Placenta previa persisting beyond 28 weeks        | Type I diabetes that is not well controlled   |  |
| gestation   | Intrauterine growth restriction<br>Preterm labor<br>Incompetent cervix<br>Shortness of breath without exertion                                  |  |
| Nutritional concerns (including eating disorders) |   |  |
| Mild respiratory conditions                       |   |  |
| Smoking   |   |  |
|   |   |  |



**Absolute Contraindications** 

to Exercise During Pregnancy

Systolic blood pressure ≥ 140 mmHg, diastolic blood pressure  $\geq$  90 mmHg (with or without

Pre-exercise blood glucose level ≤ 4 mmol/L

nbranes

Resting heart rate >120 bpm

proteinuria)



ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY, APTA

### **ORF-SIG DASHBOARD:**



### PRESIDENT'S MESSAGE

Molly Malloy | President, ORF-SIG

"If you want to go fast, go alone. If you want to go far, go with others." (African Proverb)

#### **ORF-SIG** Members,

Looking ahead to the New Year it is always good to pause and reflect. The most important thing I have learned in my career is that to be successful I need to focus on building bridges and making connections. Just as the African Proverb states, "If I want to go fast, go alone. If you want to go far, go with others." I can accomplish much more in a day, year and lifetime by working with those who help me to stay on task, think outside the box and push me to move ahead. Approximately 10 years ago, I realized that expanding my network within the residency and fellowship realm would significantly assist me with my daily challenges as a program director. Those of us in leadership of the ORF-SIG recognize that few colleagues really understand our roles and the challenges that we face daily. I am eternally grateful for the support, ideas and extra work that this group provides to unify and advance post-graduate education. I challenge all of us to work together in the year ahead to expand our networks, develop systems that are more efficient and unify as we face the challenges of post-graduate education.

Looking ahead to CSM I am hopeful to meet many of you in San Diego. I also want to be sure everyone knows which events to place as a high priority in your busy schedules (see list below). As I said this is where I actually connect with colleagues who understand post-graduate education. Utilize CSM as an opportunity to meet, network, learn, collaborate and to hear how others in the ORF-SIG are navigating their programs. I hope that you will learn some things that help make your daily lives easier and we are excited to hear ideas that you have for moving forward!

We are always looking to expand our village. Make sure you reach out with questions, ways to get involved and come meet us in person at CSM. We are excited about all that 2023 has to bring. If you would like to get more involved within the SIG, make sure to reach out to malloyma@arcadia.edu. Thank you for all of the work you are each doing every day for your residents, fellows and our profession!

> Molly Malloy President, ORF-SIG

### CSM 2023 ORF-SIG events

### ORF-SIG Annual meeting Thursday Feb 23, 2023 6:30AM

Join us to network, hear from our leaders and discuss what we are doing as a SIG and where we can go in the year ahead.

### Pre-conference: Tuesday Feb 21, 2023 8AM-5PM OR-13940—CREATING AND MAINTAINING COMPETITIVE RESIDENCY AND FELLOWSHIP PROGRAMS: INNOVATIONS FOR CURRICULUM DE-SIGN, MENTORING, AND INTER-PROGRAM COLLABORATION

link: https://apta.confex.com/apta/csm2023/meetingapp.cgi/Session/13940 Are you a faculty member, mentor or program director/ coordinator who is looking for ideas for how to streamline or improve your residents/fellows experience? This is a collaborative and fast paced day which will share ideas for how other programs are working to improve efficiency with assessing competencies, examinations, annual reporting, mentoring and lots more.

### Education session: Thursday Feb 23, 2023 3-5PM OR-14033±MENTORING SMARTER NOT HARDER

Link: https://apta.confex.com/apta/csm2023/meetingapp.cgi/ Session/14033

All advanced clinicians are living in a world of time constraints, productivity challenges, and yet many of us still feel a calling to mentor developing clinicians. How can we realistically mentor others in a fast paced work environment? This session is designed for mentors and future mentors of all levels including students, new professionals, residents, fellows, and faculty. Learn strategies for designing and implementing effective mentoring sessions to foster clinical reasoning and to develop efficient and evidenced based clinicians.

#### **Residency and Fellowship Marketing Ideas**

A recent challenge for many programs has been applicant volume. With programs expanding, new programs being added and application volume declined across the country we are all feeling the crunch. The ORFSIG is doing two things to try to address this issue. First is addressing how we demonstrate the true value of post-graduate education to our clinical partners. A universal post-graduate survey is being developed to look at the overall value of our program graduates. This will be a universal survey. If we are all collecting the same information then we will be able to more efficiently analyze the benefits of clinicians who complete a residency/fellowship. Stay tuned for more information. If you are interested in getting involved, please reach out. Second, the ORFSIG is tackling how to market our programs effectively. I asked 4 of our senior leaders what they are currently doing to effectively market. Here is what they said:

### Kirk Bentzen, VP of ORFSIG



"Having a robust student program is a key for our residency programs to recruit in qualified applicants. Each Therapy & Wellness Center PT is required to take 2 students per year – this results in over 50 students coming across our doors that get exposed to the quality clinical instructors (who are also mentors). This, in turn, motivates the students to apply for our residency program."

#### Kathleen Geist—President of Georgia APTA



Our state association hosts a residency fair through our student FIN. We have graduates at the fair that speak about the highlights of the program to other students in the state. We also had a student conference this past fall with 200 students in attendance and we had programming related to residency education. This is not program specific but are promoting residency education to students across the state.

### Aimee Klein PT, DPT, DSc



We look for candidates that are selfdirected in their learning. This allows them to participate in clinical practice, but also be a lab instructor in selected DPT courses, participate in clinical research and develop a case report that can be disseminated, either publication or poster. We have 5 clinical mentors who are all Board Certified in Orthopaedic Physical

Therapy, who provide the residents with diversity of clinical reasoning, clinical perspectives, different regional expertise.

### Stephen Kareha DPT, ATC, PhD



Our network takes about 150 DPT students each year and one of our faculty members has a brief conversation about post-graduate opportunities (including CE, employment, private practice, residency, fellowship, etc) with each of the students about ½ way through their rotation. I think the best conversations were not specifically to recruit, but just

to answer questions – those are the ones that typically have led to obtaining the best residents (either directly or indirectly). We have multiple faculty from our residency adjunct at DPT schools nearby, which increases our exposure.

### **ADDITIONAL RESOURCES:**

### **Applicant Registry:**

Steve Kareha, Molly Malloy, 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. Our team had been working hard to collect interested applicants to attempt to steer them to open positions. We are brainstorming to revise this system to tackle the problem from the front end focusing on the following:

- 1. Raise awareness for our programs.
- 2. Steer qualified applicants to our programs.
- 3. Address the problems of open positions throughout the country.

In the meantime, you can continue to use this link for an excess of applicants who you are open to sharing of their information. 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

 Currently, everyone who was on this list has been admitted into a program.

Residency & Fellowship Qualified Applicants http://bit.ly/3uOJROs



### PROGRAM RESIDENT/FELLOW/ FACULTY SPOTLIGHT:

Caitlyn Lang, Kristine Neelon, Bob Schroedter

### What is the Program Spotlight?

It is an ORF-SIG, member-only feature that allows one or more orthopaedic residency/fellowship programs to be Spotlighted within a given month to market themselves to prospective candidates and those seeking more information on post professional education in orthopaedics. Additionally, programs will also be spotlighting individual faculty and/or residents/fellows-in-training as good-will ambassadors of their respective programs.

### What are the benefits to being Spotlighted?

Programs that are Spotlighted advance the exposure and interest in post professional orthopaedic physical therapy programs across the country, thus bolstering their program's sustainability. Furthermore, by providing important, decision-making details about their program a prospective candidate can make a better-informed decision about which program may be a good fit for them.

### Who is eligible to apply?

Program coordinators or Program directors may apply for their program as long as they meet the following pre-application criteria:

- The program must be ABPTRFE or ACOMPTE accredited or in Candidate status.
- The Program Director or Coordinator must be a member of the AOPT and ORF-SIG.
- The Program Director or Coordinator must have a specialization in Orthopaedics
- Please visit: <u>https://www.orthopt.org/content/special-interest-</u> groups/residency-fellowship/orf-sig-program-spotlight/spotlight-program-faqs

### **ABPTRFE Frequently Asked Questions Documents:**

Recently, the American Board of Physical Therapy Residency and Fellowship Education (ABTPRFE) released updates to their Policies and Procedures including some changes to the Primary Health conditions and COVID-19 accreditation recommendations. The ORF-SIG was able to work with the Chair of ABP-TRFE, Mark Weber, and the Lead Accreditation Specialist, Linda Csiza. Together, they provided some further elaboration on several Frequently Asked Questions. Check out these documents here:

- Policy 13.5 Addition of Practice Sites FAQ
- Primary Health Conditions / Medical Conditions List FAQ
- CoVid-19 Temporary Guidance FAQ
- Program Sustainability: Applicant Sharing and Recruitment FAQ



### **RF-PTCAS:**

Kirk Bentzen, Steve Kareha, Megan Frazee, Carrie Schwoerer, Christina Gomez

If you are a newer program or need a refresher on some of the nuances of the processes and timelines, please review the following podcast: *Navigating RFPTCAS*, which can be found <u>https://musc.hosted.panopto.com/Panopto/Pages/Embed.aspx?id=0841c14e-a3f7-4196-b654-acd90169c9e2</u>. Presenters of this podcast included Ryan Bannister, Director-Centralized Application Services and Student Recruitment and Orthopaedic Residency as well as Fellowship SIG leadership members Kirk Bentzen, Christina Gomez, and Steve Kareha.



Please contact Carrie Schwoerer (<u>cschwoerer@uwhealth.org</u>) with questions.

### **OTHER KEY RESOURCES:**

ABPTRFE Updates: Community HUB

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

- Updates to ABPTRFE Processes and Procedures
- What Sites Should, and Should Not, Be Included on the Participant Practice Sites?
- <u>ABPTRFE Recent Actions</u>
- July 1 Policy Reminder



### **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.

- Virtual Site Visit
- **RF-PTCAS** Reminders

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





ANIMAL REHABILITATION ACADEMY OF ORTHOPAEDIC PHYSICAL THERAPY. APTA

### **PRESIDENT'S MESSAGE**

Francisco Maia, PT, DPT, CCRT

This is our last quarterly newsletter issue before CSM 2023, and I very much look forward to attending it in person once again! One of the things I miss the most is our ability to network and connect with physical therapists and students interested in the field of animal physical therapy during those events, and this year we are planning something very special. I honestly do not have all the details as I write this letter a few months before CSM, but please look for any announcements we will be sending by email with more information about our in-person Meet & Greet session at CSM where Jenny Moe, our Vice President, and I will host an event to network and talk animal physical therapy with any attendee interested in learning more about this field.

Given that CSM 2023 will take place in San Diego, I also wanted to take the opportunity to bring awareness once again to the legislative "battle" we have faced in California for over a decade for physical therapists to be able to work with animals. Karen Atlas wrote a very succinct and detailed article explaining more about that in our April 2022 newsletter, and I highly recommend reading that article if you haven't yet. Karen's work in California to help physical therapists' legal ability to work with animals has been relentless and unwavering, but she does need our help going into 2023. Folks often ask me how they can help with legislative changes for animal physical therapy, and this is exactly how every single one of you can have a tremendous impact on our fight! As you can imagine it costs money to fight legislative battles, quite a bit of money in fact, and although our SIG has worked with Karen to help secure as many funds as we can for her coalition, we could use your help! Please follow the link below to a GoFundMe page and donate and share as much and as many times as you can. No amount is small enough as every little bit helps. Additionally, sharing it with your friends on social media can help spread the word even more!

https://gofund.me/2330cdad Thank you, Francisco Maia, PT, DPT, CCRT fmaia@orthopt.org

### PHYSICAL REHABILITATION FOR SEVERE **BILATERAL FLEXOR TENDON LAXITY AND AVULSION FRACTURES IN THE CARPAL** JOINTS IN A NEWBORN MINIATURE BOVINE

Kaitlyn Arnsdorf, PT, DPT Elite Rehabilitation, Charleston, SC

Flexor tendon laxity in ruminant farm animals is a fairly common occurrence. The cause of this is either due to a lack of selenium (in which case a shot of BO-SE° is the cure), or the way the animal is positioned in utero. In Mooey's case, she was tested for selenium deficiency and was not deficient, therefore, it was the result of how she was positioned in utero.

History: Mooey is a miniature zebu cow who was born on March 9, 2022. I acquired Mooey from a breeder on March 18th when she was 9 days old and unable to stand on her own for longer than a second and unable to walk. Upon Mooey's initial examination, she had carpal hyperextension angles of +75° on the right carpal and +78° on the left carpal. She could not support her body weight at this time, and after 2 veterinary consultations both recommended euthanasia due to the severity of her laxity in combination with the bilateral avulsion fractures. The avulsion fractures were not severe, but I knew if she continued to attempt to weight bear without external support they would increase in severity.



First attempt to cast Mooey was done using air splints with vet wrap and duct tape using a cross body method to attempt to keep the splints in place and to add additional support. A picture of this method is shown below.

Although this normalized her gait pattern and allowed her to ambulate without assistance, the air splints were not strong enough to withhold the pressure her joints applied to the material and in just 2 days she had deformed the material, which caused her carpal joints to stay in hyperextension. Therefore 2 days later, with the help of Elizabeth Payumo OTR/L, CHT, we constructed thermoplastic splints that were custom molded to Mooey's legs. We opted to mold the splints into 10° of carpal flexion instead of a closed pack position of 0° flexion/extension, so that she could walk with a more normalized gait pattern and strengthen her

tendons. This decision was made after observing how she ambulated with compensatory gait a pattern when she was put at 0° knee extension with the air splints. Mooey's custom thermoplastic splints are shown below:

A few days after wearing the thermoplastic splints, it was noticed that





Mooey was getting pressure wounds from the material. She was also starting to bend the thermoplast. I then made the decision to use fiberglass casting to maintain her carpal joints at 10° of knee flexion and used heavy gauze padding as a liner to prevent pressure wounds.

Other therapy techniques were held for the 2 weeks that Mooey was in her fiberglass casts. When the casts were removed 2.5 weeks later, Mooey had only  $+20^{\circ}$  of bilateral carpal extension, which was over a 50° improvement from when she was first evaluated.



Mooey in her fiberglass casts

Once the fiberglass casts were removed, Mooey was placed back in the thermoplastic casts that were removed daily for physical therapy sessions. Physical therapy consisted of dry needling to the carpal extensor muscles every other day (due to research showing during EMG testing comparing pre and post needling, the amount of full muscle recruitment post needling was significantly greater than it was pre-needling), weight shifting using a Physio Ball, and therapeutic exercises using clicker training to get Mooey to back up, and touch a target in order to isolate various muscles for improved strengthening.

After 2 more weeks in her thermoplastic splints, Mooey was able to walk without her casts and a few days later she started running on her own. At the time she had  $+5^{\circ}$  of carpal extension on the left and  $0^{\circ}$  of carpal extension on her right when standing in neutral stance.

Therapy was discontinued at that time as it was thought Mooey would finish rehabbing herself simply by weight bearing and ambulating with proper angulation and without compensation.

Mooey is now 100% recovered and has been since the end of April. She not only has maintained the gains she made, but has improved her angulation to normal and you could never tell that she couldn't walk at the beginning of her life!

In summary, I am thankful for the help of my co-workers in casting Mooey, as well as their input. If I had to do it all again, I would have started Mooey out with serial casting with the fiberglass instead of working with the less restrictive material first. Although the latest research in humans is gravitating away from braces for prolonged periods and even at all, they absolutely still have a time and a place. Not knowing anything about cows, especially



miniature ones, I had no idea how severe Mooey's hyperextension was at initial examination. The only vet protocols I could find on splinting had ones for 20° hyperextension and Mooey's was close to 80°. I believe any newborn ruminant born with more than 50° carpal hyperextension needs to receive custom fiberglass casting for at least a week. Overall, I am very pleased with the outcome considering she had a less than 5% chance of survival given to her by several vets. The real game changer I believe that allowed me to cast Mooey in the best way possible was through the advice of physical therapist, Laurie Edge Hughes, who told me to stop thinking about the fractures and trying to stabilize them, and focus on the tendons first because those were worse. It was for this reason I decided to try casting Mooey in slight carpal flexion, and this I believe was key in her making a full recovery. Current casting protocol for this condition suggests to put them in 0° extension (or neutral) which I believe would have created a compensatory gait pattern for Mooey due to the necessary carpal flexion that needs to occur during ambulation.

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## THE FEMALE ATHLETE THROUGHOUT THE LIFESPAN

Independent Study Course 32.2

### Description

This course provides a comprehensive review of the growth, maturational, musculoskeletal, physiological, biomechanical, and training-related injury risk factors unique to the female athlete. Evidence-based management of the young, pregnant/postpartum, and mature female athlete across the care continuum from injury prevention training to injury rehabilitation to safe return-to-activities is discussed. Throughout each monograph, extensive information is provided on the specific evaluation techniques, outcome measures, and rehabilitation approaches most pertinent to this unique population. These monographs also explore how growth, pregnancy, and aging related changes impact exercise tolerance/performance, and discuss current exercise guidelines. These monographs provide a comprehensive resource, combining scientific and clinical knowledge, for the physical therapist management of the female athlete throughout the lifespan.

### **Topics and Authors**

Rehabilitation Considerations for the Pediatric and Adolescent Female Athlete Christy Zwolski, PT, DPT, PhD, OCS

The Pregnant and Postpartum Athlete Rita Deering, PT, DPT, PhD; Shefali Mathur Christopher, PT, DPT, SCS, LAT, ATC

The Master Female Athlete Theresa L. Schuemann, DPT, DPT, SCS, ATC



### American Physical Therapy Association

### **Learning Objectives**

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

- 1. Identify growth, maturational, biomechanical, and training related risk factors for injury among young female athletes.
- Understand the physiological, musculoskeletal, and psychological changes that often occur during pregnancy and after childbirth.
- 3. Understand the age-related changes that occur in the master female athlete and how these changes affect performance.
- 4. Recognize common acute and overuse injuries sustained by the female athlete at various stages of life.
- 5. Understand the principles and key components of injury prevention training for female athletes throughout the lifespan.
- 6. Utilize clinical decision-making to select appropriate examinations and treatment strategies of the young female athlete, the female patient during pregnancy and postpartum, and the mature female athlete.
- Understand important guidelines for effective exercise prescription to address specific needs of the young female athlete, the female patient during pregnancy and postpartum, and the mature female athlete.

### **Editorial Staff**

Editor—Guy G. Simoneau, PT, PhD, FAPTA Associate Editor—Dhinu Jayaseelan, PT, DPT, OCS, FAAOMPT Managing Editor—Sharon Klinski

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### Current Concepts of Orthopaedic Physical Therapy

### **Topics and Authors:**

Integration and Application of the Scientific Method, Evidence-based Practice, and Clinical Reasoning Sean P. Riley, PT, DPT, ScD

ISC

- The Cervical Spine: Evidence-Informed Physical Therapy Patient Management Eric K. Robertson, PT, DPT, OCS, FAAOMPT Mary K Derrick, PT, DPT, OCS, FAAOMPT
- 4 The Thoracic Spine; Rib Cage: Evidence-Informed Physical Therapy Patient Management Scott Burns, PT, DPT, OCS, FAAOMPT Michael O'Hara, PT, DPT, OCS William Egan, PT, DPT, OCS, FAAOMPT
- 7 The Wrist and Hand: Evidence-Informed Physical Therapy Patient Management

Mia Erickson, PT, EdD, CHT, ATC Carol Waggy, PT, PhD, CHT

10 The Hip: Evidence-Informed Physical Therapy Patient Management Keelan Enseki, PT, MS, OCS, SCS Dave Kohlrieser, PT, DPT, OCS, SCS Allison Burfield, PT, DPT, OCS 5 The Shoulder: Evidence-Informed Physical Therapy Patient Management Amee L. Seitz, PT, PhD, DPT, OCS Heather Christain, PT, DPT, OCS, SCS Adam Lutz, PT, DPT, PhD Ellen Shanley, PT, PhD, OCS

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The Lumbar Spine: Evidence-Informed Physical Therapy Patient Management Max Jordan, PT, DPT, PhD

#### The Knee: Evidence-Informed Physical Therapy Patient Management

Wm Gregory Seymour, PT, DPT, OCS, FAAOMPT Scott Fenstermacher, PT, DPT, GCS, OCS Jerry Smith, PT, DPT, OCS Scott Dickenson, PT, DPT, SCS Patrick Carter, PT, DPT Tara Jo Manal, PT, DPT, OCS, SCS

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12 The Foot and Ankle: Evidence-Informed Physical Therapy Patient Management Lindsay A. Carroll, PT, DPT, OMPT Stephen Paulseth, PT, MS, DPT, ATC John J. Fraser, PT, DPT, PhD RobRoy L. Martin, PT, PhD, CSCS

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