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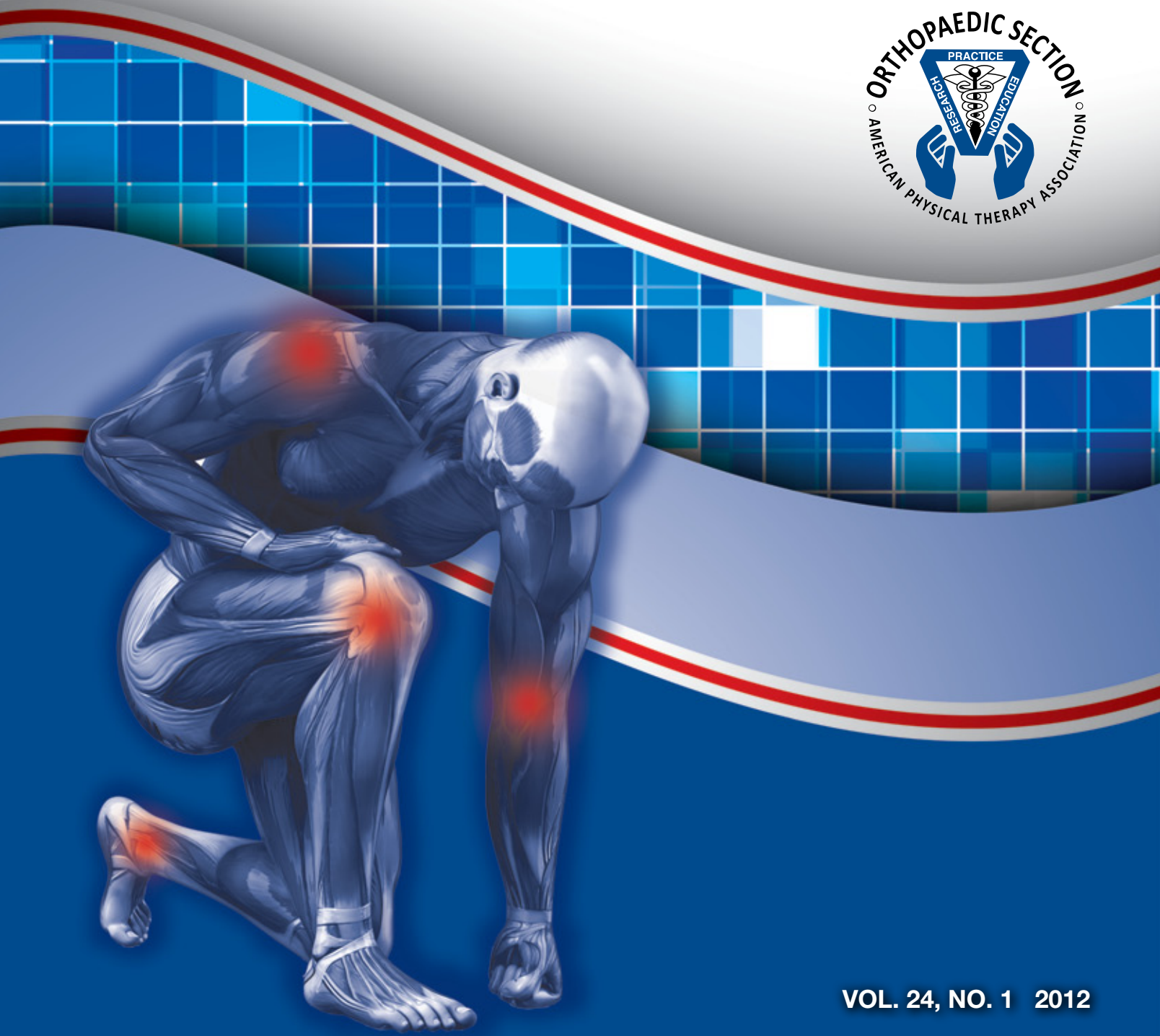

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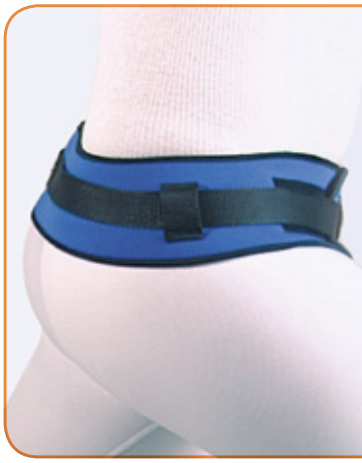

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ORTHOPAEDIC Physical Therapy Practice

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In this issue

Regular features

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University of Pittsburgh
Department of Orthopaedic Surgery
3471 Fifth Ave.
Rm 911 Kaufman Bldg.
Pittsburgh, PA 15260
(412) 605-3351 (Office)
jirrgang@pitt.edu
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University of Southern California Dept of
Biokinesiology and Physical Therapy
1540 E Alcazar Street - Chp-155
Los Angeles, CA 90089-0080
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kulig@usc.edu
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1214 Starling St
Steilacoom, WA 98388-2040
(253) 588-5662 (Office)
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Term: 2005-2013

Office Personnel

(800) 444-3982

Terri DeFlorian, Executive Director
x204..... tdeflorian@orthopt.org
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x203..... tfred@orthopt.org
Sharon Klinski, Managing Editor J/N
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School of Physical Therapy
Slippery Rock University
Slippery Rock, PA 16057
(724) 738-2757
chrisjhughes@consolidated.net

Managing Editor:
Kathy Olson
(800) 444-3982, x213
kmolson@orthopt.org

ORTHOPAEDIC PRACTICE
Editor:
Christopher Hughes, PT, PhD, OCS
School of Physical Therapy
Slippery Rock University
Slippery Rock, PA 16057
(724) 738-2757
chrisjhughes@consolidated.net

Managing Editor:
Sharon Klinski
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sklinski@orthopt.org

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JOSPT
Editor-in-Chief:
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P.O. Box 1881
Milwaukee, WI 53201-1881
(414) 288-3380 (Office)
(414) 288-5987 (Fax)
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Executive Director/Publisher:
Edith Holmes
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Editor's Note

Tools of the Trade: Time to Look Under the Hood!

Christopher Hughes, PT, PhD, OCS

Like any other profession we as PTs also have our own bag of tools to help us complete our job. Amazingly we have functioned pretty well with some basic instruments. As experts in the assessment and treatment of movement disorders and musculoskeletal pathology, we routinely measure range of motion, girth, strength, and reflexes, using a goniometer, tape measure, dynamometers, and reflex hammer. Physical therapists can be pretty creative when it comes to determining patient function. Whether it be with a stopwatch for gait, foam pad for balance, or even a scale for weightbearing we get the job done.

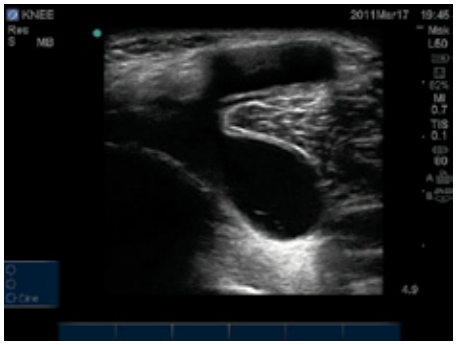
New technologies continue to infiltrate the market. Seeking the "best way" to evaluate and treat using technology has become at times a never-ending quest for the ideal. Modalities have always been a part of physical therapy even at the expense of lack of evidence with regard to their effectiveness. Whether, cheap or expensive, one thing you can count on is that the exhibit hall at CSM this year will be filled with more gadgets and innovations that promise a better way to do our job. Time will tell.

In many clinical situations, we perform indirect assessments or we observe the effects of something. For example, we observe and assess the expression of strength as a patient rises from a chair; we assess balance through the patient's ability to negotiate obstacles. From this performance, we infer a reason, a cause. Almost like a mechanic who has to diagnose a car problem based on just hearing abnormal sounds.

But it is amazing to me that the one area that is the driving force of all these movements has never really been seen "in action" by most physical therapists; that being the miracle of dynamic muscle contraction. We all have seen "expired" muscle in the cadaver lab and animations of muscle through software modeling have become more common with technology. Granted we can get close by palpation and seeing changes in girth with muscle effort but wouldn't it be fascinating to go beyond these conventional methods and "take a peek under the hood" and see muscle in action! Whether it is healthy or injured tissue, I want to gain a new perspective on muscle and injury. In the past we have been so reliant on others' decisions with regard to what we are privileged to see and how it is interpreted (diagnostic testing). Enter the world of musculoskeletal (sonography) ultrasound. New advances in technology have recently pushed this technology to the forefront despite it being around for awhile. Let's face it…you know you have made it when you get airtime on ESPN!

The dilemma? As with any application of technology, limited criteria on techniques, protocols, standards and training currently exist for physical therapists to learn its application. Few academic institutions have access and even fewer physical therapists have even seen it used. Can this instrumentation change the way we view muscle action, assess injury, and measure healing response? Well it's time to find out. As you may know the Orthopaedic Section has a newly created Imaging SIG led by Interim President, Douglas White, PT, DPT, OCS. Many of our members have found imaging education to be a vital part of practice and it is certainly one of the more common additions to curriculums expanding to the DPT. The Imaging SIG will be a great resource. The mission and goals of the Imaging SIG can be found at: http://www.orthopt.org/eig_image.php.

Want more? Then check out the preconference course the Imaging SIG is sponsoring on Sonography for Common Lower-Extremity Orthopedic and Sports Conditions (see pages 30 - 31). This course aims to provide an overview of the physics of sonography and offer education on how to apply musculoskeletal sonography for common hip, knee, and ankle conditions. The indications and limitations of sonography and other imaging modalities in musculoskeletal conditions will be discussed. Participants will also apply techniques learned using hands-on sessions with live demonstrations and practice sessions. After all, isn't it about time you looked under the hood to see what you have been working with all these years!



Baker's Cyst

Power Doppler Patellar Tendonosis

A special thanks to Joe Cygan, MS, ATC, from Sonosite (www.sonosite.com) for providing these images.

REFERENCE

Catherine L, Pottera CL, Cairns MC, Stokes M. Use of ultrasound imaging by physiotherapists: A pilot study to survey use, skills & training. *Man Ther.* 2012;17(1):39-46.

Guest Editorial

A Tribute to Jayne Snyder, PT, DPT, FAPTA

Jayne Snyder

PT, DPT, FAPTA
3/12/1945 - 10/5/2011

Jayne Snyder, PT, DPT, FAPTA, graciously with great passion and dignity, passed away in October after a year-long valiant fight with pancreatic cancer. Jayne was best known in the profession of Physical Therapy for her untiring participation in the APTA as a member of the Private Practice Section, the Board of Directors, and the Foundation for Physical Therapy.

Jayne ran through her life at stealth speed just as she ran through her yearly marathons that she trained for and participated in for decades. Jayne went through running shoes as frequently as others went through clean socks, and always with determination and a smile. Not completing a race or finishing a job well done was not an option for Jayne.

Jayne was born March 12, 1945 in Lincoln, Nebraska to parents William and Helen Snyder. She had one brother William who died in an accident when he was younger. Jayne graduated from the University of Nebraska with a degree in physical education and initially taught but heard her calling and went on to graduate from Stanford University where she received her education as a Physical Therapist. Following graduation Jayne again returned to Lincoln, and became the first physical therapist at the University of Nebraska Athletic Department. Additionally she was an Assistant Professor for the University's Division of Physical Therapy. An avid businesswoman, she founded Snyder Physical Therapy in 1986 where she practiced until last year after 34 years as a revered clinician. Always the consummate professional, Jayne supported the APTA's Vision 2020 and completed her Doctor of Physical Therapy transitional degree at A.T. Still University.

Dr. Snyder served the APTA at the state and national levels. Jayne was elected President of the Nebraska Physical Therapy Association and a delegate for the Nebraska chapter for 6 terms. She served in numerous leadership roles including two terms as the Vice President of the APTA, the Board of Directors, and as President of the Foundation for Physical Therapy. In recognition of her contributions to practice, education, service, and research, she was awarded the Catherine Worthingham Fellowship Award in 2010.

Jayne will be remembered for her tireless efforts to create and fund Rails for Trails, her commitment to quality patient care especially in her beloved Lincoln and for the recognition and strength she garnered for the Foundation in its support of clinical research and the advancement of PT researchers. She has imprinted on those that knew her and has left indelible footprints for those who will follow her role modeling as a servant leader to her community, patients and profession. For those who sense a void with her absence, fill this with fond memories and a smile, for Jayne would want it that way.

Dr Jan K Richardson, PT, OCS, FAPTA
Professor Emeritus
School of Medicine
Duke University Medical Center

The Jayne Snyder Scholarship Fund was established in November 2010 to honor her contributions to APTA, the profession, and the community. The scholarship fund is available to single mothers or fathers who exhibit the determination and desire to return to school to obtain a professional or postprofessional degree from a physical therapist education program. Donations to the Jayne Snyder Scholarship Fund can be sent to the PT Fund at 1111 N Fairfax St, Alexandria, VA, 22314. Checks should be payable to "PT Fund" and "Jane Snyder Scholarship Fund" should appear in the memo line.

President's Corner

James J. Irrgang,
PT, PhD, ATC, FAPTA

I hope you had a joyous holiday season! With the beginning of the New Year, I want to update you on several initiatives that the Orthopaedic Section is currently engaged in.

NATIONAL ORTHOPAEDIC PHYSICAL THERAPY OUTCOMES DATABASE

Consistent with the Orthopaedic Section's strategic plan, the Section is making plans for a pilot program to collect outcome data for patients with neck pain. In this pilot project, we will collect information related to examination, evaluation, classification, treatment, and outcomes for patients with neck pain. The data collected for this project will be consistent with the framework for examination and treatment of neck pain that is described in the Section's Clinical Practice Guidelines for Treatment of Neck Pain.

The pilot project is open to any Section member that wishes to participate. Pilot program participation will require collection of outcomes data on 10 patients with neck pain over a period of 6 months. To standardize data collection, paper-based forms have been created and a manual of operations and procedures is being developed that will accompany the data collection form to improve consistency in collecting and recording data.

Completed data collection forms will be forwarded to the Section for entry into a computer database. Once data collection is complete, analysis will be performed to determine completeness of the collection, adherence to treatment guidelines, and achievement of clinical outcomes. Feedback will be provided to each individual that submits data comparing their data to the rest of the data collected. We also plan to survey those that participate in the pilot project to determine the burden of data collection and the usefulness of the information that is provided back to the individual. The results of this pilot program will be used for further planning of an Internet-based outcomes data collection system to assess clinician performance.

It is planned that the manual of operations and procedures will be completed and the pilot project announced at the Combined Sections Meeting in Chicago. Contact the Section office if you are interested in participating in this project.

CLINICAL RESEARCH NETWORK

Another project in the Orthopaedic Section Strategic Plan that is coming to fruition is the establishment of a grant to fund a Clinical Research Network. The Clinical Research Network will link established researchers with clinicians to work collaboratively on one or more clinical research projects that will contribute to the evidence base for the practice of orthopaedic physical therapy. An important component to ensure success of the Clinical Research Network is active participation of any Section member who is interested and committed to participate in the project. This will provide Section members interested in research, but do not have all of the resources to independently conduct a research project, the opportunity to contribute and advance the practice of orthopaedic physical therapy. The involvement of multiple clinicians and practices in the Clinical Research Network will enable projects to be completed efficiently thus enhancing the generalizability of the results to practicing clinicians. Once established, the Clinical Research Network can be used by other members of the Orthopaedic Section to conduct additional clinical research projects.

At its fall meeting, the Section Board of Directors voted to include funding to establish a Clinical Research Network in the 2012 budget. Total funding for the Network was approved at $300,000 over a 3-year period, with a maximum expense of $100,000 per year. To support and assure success of the Network, a Steering Committee will be established to provide oversight and guidance for the investigators to ensure that the study milestones are achieved and Section funds are used efficiently.

A call for proposals to establish a Clinical Research Network will be released at the Combined Sections Meeting in Chicago. Initially, investigators wishing to establish a Network will submit a short pre-proposal

(continued on page 12)

Conservative Management of a Postsurgical Patient with Chordoma and Back Pain

Mary Calderan, PT, DPT

Merrimack Valley Physical Therapy, Bedford, NH

ABSTRACT

Background and Purpose: The purpose of this case report is to describe the clinical decision making underlying development of a rehabilitation program, and subsequent limitations in outcome for a patient with back pain following internal fixation secondary to chordoma. **Case Description**: The patient was a 60-year-old female who presented with back pain 18 months following removal of the L2 vertebra due to the presence of a chordoma. The surgery included internal fixation and an allograph fusion. After acute rehabilitation, the patient attempted independent exercise but over time was unhappy with her residual limitations. She pursued outpatient physical therapy after recent follow up with her surgeon and approval from her insurance company. Her postural deficits clearly indicated a reason for her dysfunction, though the underlying cause was difficult to accurately discern. Conservative physical therapy treatment provided temporary relief and progress toward improved function but the patient still felt something was wrong. **Outcomes:** The patient demonstrated improved strength, endurance, and function but her pain remained a limitation to her anticipated goals. She was concerned there might have been a recurrence of the chordoma that could only be determined by diagnostics. Physical therapy was discontinued. Her return visit to the surgeon revealed no chordoma but the allograph had failed and a rod had broken. Subsequent surgery was scheduled to replace the rod and revise the fusion that reportedly improved her status. **Discussion:** With limited resources to guide the clinical management of patients with chordoma, it is important to pay close attention to the potential red flags that may represent an unexpected outcome. Without immediate access to the results of diagnostic imaging, clinical decisions become critical and based on experience and patient response. In these cases it is therefore imperative to communicate your findings to the physician.

Key Words: chordoma, back pain, exercise, clinical decision making

INTRODUCTION

Chordoma is a primary malignant bone cancer that develops from remnants of embryonic notochord in the skull base and spine.[1] The notochord forms the early spine in the beginning stages of early development.[2] As the spine replaces the notochord, small areas can remain that allow for chordomas to develop. These rare tumors can occur at any location along the spine and are more commonly found in the clivus (a small bone in the skull) and the sacrum. Approximately 6% of spinal chordomas originate in the lumbar spine.[3] In the United States, there are around 300 new cases of chordoma diagnosed each year.[1] Therefore, the incidence of chordoma is approximately one new case per million people per year. With an average survival rate of 7 years, the number of people living with chordoma is just over 2000. The average age for chordoma diagnosis is 55, though chordomas can occur at any age from infancy to older age. The male to female ratio for spinal chordomas is 2:1.[3]

The cause of chordoma is unknown. It does not appear to be related to trauma, environment, diet, or medication. The general consensus is that chordoma is not inherited although there have been reports of cases of multiple affected family members.[1] As these rare, life threatening, tumors tend to be slow growing, the symptoms go undetected for a while before any medical attention is pursued. Symptoms of a skull base chordoma can include headache, neck pain, double vision, or facial nerve palsy. Spinal chordomas may present with back pain, extremity weakness, numbness, or tingling. Paresthesia and pain are the most common complaints though motor deficits due to spinal cord or spinal root compression can occur. Sacral chordomas tend to be large and palpable and will cause changes in bowel and bladder function. With spinal chordomas, the lower spinal level means a longer survival and the mortality rate of lumbar chordoma is better than that for thoracic or cervical lesions.[3]

Chordoma is best diagnosed through diagnostic imaging. At present, magnetic resonance imaging (MRI) is definitely the method of choice for the diagnostic and preoperative assessment of spinal column chordomas.[3] Treatment for spinal chordoma includes surgical resection, radiation therapy, and sometimes chemotherapy. The current surgical protocol for spinal chordomas consist of total removal of the lesion with a wide margin, spinal decompression, reconstruction, and stabilization of the spine at the same time.[3] It is possible for the tumor to recur if the removal is incomplete. Metastasis is a possibility, but is more commonly found in sacrococcygeal and lumbar tumors. Lumbar chordoma metastasis rate is the highest.[3] Jawad and Scully[4] report surgery significantly improves the overall survival rate for patients with chordoma.

As chordoma symptoms may present similar to many common complaints of back pain, it is important to be aware of this rare form of cancer. Differential diagnosis should include diagnostics especially if symptoms do not resolve with traditional care.

The purpose of this case report is to describe the presentation, clinical decision making, rehabilitation management and complications in the outcome of a patient with back pain following surgery for chordoma.

CASE DESCRIPTION

The patient is a 60-year-old female who reportedly experienced back pain in October 2008. She saw her primary care physician thinking she might have kidney stones. Plain film radiographs revealed an anomaly that prompted a referral to an orthopaedic oncologist. In November 2008, a biopsy confirmed the diagnosis of L2 chordoma and the recommended course of treatment was initiated. She completed preoperative radiation before complete resection and reconstructive surgery. This involved two separate surgeries. The plan involved instrumentation from T10 to L4 with decompres-

sion of L1, L2, and L3 using a posterior approach. The second surgery would use an anterior approach and involve removal of L2 and reconstruction of L2 with allograft and instrumentation from L1 to L4. In April 2009, excision of the chordoma with internal fixation and allograph fusion were performed. She also underwent proton radiation postsurgically. She spent two weeks in the hospital receiving physical therapy and was transferred to a local rehabilitation facility where she continued with two additional weeks of therapy. Once she was discharged home, she was able to pursue outpatient physical therapy to address strengthening. Her insurance limited her to 25 visits per diagnosis for a lifetime so eventually her benefits were exhausted. She had progressed from using a wheelchair to a walker and over time was able to use a cane. The surgeon had recommended water aerobics, no impact exercise such as the elliptical or a stationary bicycle, and light weights as possibilities for activity. The patient kept up with the exercises independently for a while but became concerned about her technique and was less motivated to pursue activity secondary to persistent pain and depression. She was followed by her surgeon every 3 months and an MRI was performed to monitor her spine for cancer. In August 2010, the patient had a follow-up appointment during which she asked for a new referral to physical therapy. She was experiencing pain in her back that she described as a bar across her back that pushed her forward. She had difficulty standing erect and could tolerate walking only 40 feet. She was married and took care of her 4-year-old grandson two days per week. She was not content with her status and was determined to take steps to resume an independent exercise program and improve her functional endurance. The orthopaedic physician who saw her for her follow up ordered a CT scan and the report identified a slight shift of the L2 allograft with no recurrence of chordoma. The physician prescribed physical therapy and ordered core strengthening, hamstring stretching, and modalities for "new back strain." There was no activity limitation or restriction noted on the referral. She had a secondary complication of osteoporosis. She was scheduled for outpatient physical therapy evaluation in September 2010.

INITIAL EVALUATION

On the intake form, the patient indicated her average pain level on a visual analog scale as a 5 where 0 was pain free and 10 was the worst pain imaginable. She verbally reported her worst pain at an 8. She described her pain as though "she had a bar across her back that pushed her forward." It was a stiff, achy sensation that affected her from the mid to low back to her sacrum. She also reported numbness in her lower back but did not indicate any signs of radiculopathy. She reported her pain was aggravated by walking (more than 40 feet), prolonged standing, and carrying heavy (greater than 8 pounds) items. Her pain was alleviated somewhat by lying down, Lidoderm patch, and pain medication. She was taking two Percocet tablets per day. Her other prescription drugs were Zoloft (for depression) and Caltrate (for osteoporosis). Past medical history was otherwise unremarkable. She also stated her functional capacity regarding her daily activities as less than 50% ability to perform tasks. Her tolerance to sitting was one hour, driving was two hours, standing was 20 minutes, and walking was also limited to 20 minutes. She reported 0% ability for recreational activity. The Outpatient Physical Therapy Improvement in Assessment Log (OPTIMAL)[5] was used to determine her baseline confidence in doing various activities; generally, she had some confidence in her abilities. The OPTIMAL was also used to rate her baseline level of difficulty with activities. She reported moderate to much difficulty with the majority of the activities; sitting and lying down were accomplished with little difficulty.

General observations of her standing posture revealed a 12" long, well-healed incision from T8 to sacrum. She presented with an endomorphic structure, forward head posture, moderate thoracic kyphosis, and a flattened lumbar spine flexed to 20°. Her left shoulder was slightly elevated with bilateral shoulder protraction. Her weight was shifted forward with landmarks anterior to an imaginary plumb line. She was ambulating with a straight cane on the right and was wearing a Prolign back support. Her gait was marked by forward flexion and decreased step length on the right. Her single leg stance was 5 seconds on the right and the left. Spinal range of motion (ROM) was assessed through observation of movement. Knowing that her spine was internally fixated from T10 to the sacrum, it was obvious she would be limited in forward flexion to T10 (allowing 50% mobility) though she was able to compensate through her hips. Sidebending was limited to 25% on the right and 50% to the left. Rotation was symmetrical to 50% of full ROM. Extension was limited to 25% ending at T10. Passive intervertebral motion was deferred as were ligament stability tests. Slump test (as described by Magee) for sciatic nerve involvement was negative.[6] Palpation revealed hypersensitivity along the scar and paraspinal guarding in the midthoracic region to the sacrum. Her muscle length testing revealed mild tightness of her right hamstrings, where her straight leg raise was to 70°. She had moderate tightness on the left with a straight leg raise of 60°. There was evidence of iliopsoas tightness on the right compared to the left. Quadriceps tightness was evident with 110° of flexibility available during passive ROM knee flexion in sidelying. Knee extension and ankle ROM were within functional to normal limits. She did report numbness with decreased sensation to light touch across her lumbar region and abdominals. Deep tendon reflexes were not assessed as significant neurologic dysfunction was not apparent at this time. Manual muscle testing (as described by Kendall[7]) was the method employed for assessment of strength. Strength of her hip flexors was 5/5. The hip extensors were 4/5 bilaterally as were the hip abductors. Functionally, her abdominals were assessed at 3+/5.

ASSESSMENT

This patient presented with an unusual diagnosis and history. Her presentation was significant for back pain related to biomechanical dysfunction secondary to postural anomalies. According to the *Guide to Physical Therapist Practice* 2nd edition,[8] she matched the practice pattern for impaired posture (4C) as well as impaired joint mobility, motor function, muscle performance, and range of motion associated with bony or soft tissue (4I). As she had recently seen her physician and had diagnostic studies that ruled out potential recurrence of chordoma, the author felt reassured that proceeding with physical therapy intervention was appropriate. However, attention was given to her report that there had been a shift in her allograft. She did not present with significant neurologic deficits. She did have localized pain, limitations in ROM and flexibility that did affect her posture, strength, and endurance. Using the World Health Organization's International Classification of Functioning, Disability and Health (WHO-ICF) model[9] (Figure 1), functional goals were developed with the patient's input. Postural tolerance focused on short

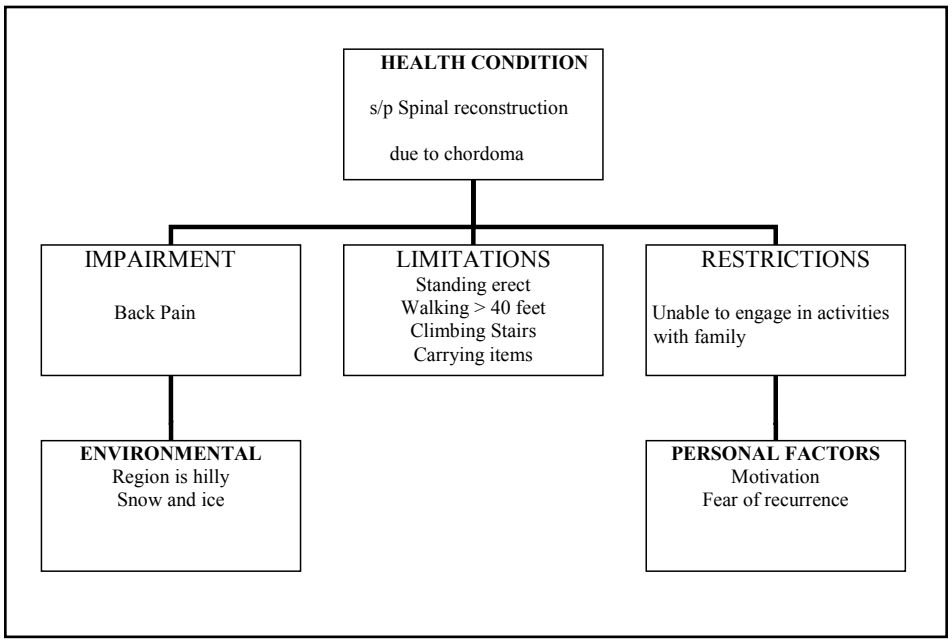


Figure 1. Placement of patient information into the ICF.

term goals to increase standing tolerance to 30 minutes within 3 weeks, to increase tolerance to walking independently to 30 minutes within 4 weeks, and to increase sleep tolerance to 6 hours within 6 weeks. Home management goals were aimed at developing strength to carry a heavy pot 10 feet within 4 weeks, vacuum half of a room within 6 weeks, and carry a laundry basket downstairs within 4 weeks. Her primary long term goal focused on resuming an independent exercise program including swimming 3 times per week.

The first choice for intervention was to establish an aquatic program. It is well documented that the physical properties of water promote healing. In their systematic review, Waller et al[10] discovered that none of the studies meeting the review criteria reported a negative effect on low back pain due to therapeutic aquatic exercise. Water immersion decreases axial loading of the spine and through the effects of buoyancy allows the performance of movements that are normally difficult or impossible on land.[11] With neck depth immersion, only about 15 pounds of compressive force (the approximate weight of the head) is exerted on the spine, hips, and knees.[11] This offloading provided this patient pain-free mobility in the therapeutic pool. Her 30-minute routine included hamstring stretching, deep water scissors, water walking, and cycling; shallow water standing 4-way kicks, marching, and knee extension in sitting. As she had a positive response to this environment, duration and repetitions were gradually increased. Within a week land-based exercise was initiated to address core stabilization. Core control is important because the osteoligamentous lumbar spine buckles under compressive loads of approximately 20 pounds and core muscles act as guy wires around the human spine to prevent buckling.[12] It was clear that more demanding core exercise would create spinal compressive loading that might have had an adverse effect on this patient. The logical move was to incorporate core strengthening with minimal load to the spine. Where this patient needed to develop her strength for functional positions and balance, the next progression was to incorporate the therapeutic ball for land-based core strengthening. Though the sitting march exercise has been identified as a less effective exercise in recruiting the rectus abdominis and obliques,[12] it is a relatively easy exercise to perform, providing a basic level to begin training the core. As the patient became more confident on the ball, postural strengthening was initiated with light resistance Thera-Band. The intention was to eventually progress to a quadruped ball exercise for improved hip extension as well as increased core demand. Proper body mechanics for lifting were reviewed including the golfer's lift and partial squat. Eventually the upper body exerciser (UBE) and stationary bike were used to supplement core stability and increase cardiovascular demand. The patient tolerated the program well and demonstrated consistent effort and carryover into a home exercise program; however, she was still frustrated with her status.

OUTCOME

Within the first 3 weeks of physical therapy, the patient reported she had no pain while she was in the pool. She discontinued use of her cane and her brace. She stated she was moving easier and could get out of bed with less difficulty. She was also working on standing more erect. By the fifth week, she reported she was sleeping better, getting closer to 6 hours. She also was able to carry a pot across the kitchen, vacuum the living room, and pull the laundry downstairs in a bag. Stairs were still a problem as they were fatiguing and her standing and walking tolerance remained unchanged. She also reported a toothache sensation in her right leg. In the following sessions, this was not reported but she was experiencing increased stiffness in her back that she related to the colder weather. With winter approaching, walking outdoors was substituted with treadmill walking. At this point, the patient was discouraged; she had thought she would have seen more progress. Limitations to progress that remained included the possibility of an underlying cause requiring further diagnostics and the question of recurrent chordoma. Before her 3-month follow up with her surgeon in December 2010, reassessment revealed she had met 75% of the original goals. But objectively it showed her thoracolumbar extension had increased. She also noted her left hip was sore. These findings were of significant concern as her symptoms were extending below the level of her surgical stabilization and fusion.

A progress letter was sent to the doctor reporting the findings and indicated therapy would be discontinued as the patient's insurance benefit had been exhausted, though we were planning on offering continued use of the pool if appropriate.

The patient returned after her follow up to her surgeon and reported that the MRI showed that the allograph fusion did not hold and one of the rods had cracked. She said the good news was that there was no recurrence of the cancer. A thoracic lumbar sacral orthosis (TLSO) was recommended and she was scheduled for two subsequent surgeries to replace the rod and reconstruct using an autograph fusion.

DISCUSSION

Chordoma is a rare diagnosis. Although there is some literature available regarding surgical intervention and treatment, there is no research regarding appropriate physical therapy rehabilitation post-chordoma

surgery. In order to develop a program for a patient with this type of surgical technique, it was helpful to research rehabilitation for lumbar internal fixation and fusion. However, research regarding specifics of therapeutic interventions in this area is also limited. One review reported that the exercise therapy group received a home program focusing on pain contingent training of back, abdominal, and leg muscle functional strength and endurance, stretching, and cardiovascular fitness.[13] Though the regime in the study was initiated at 3 months postsurgery, it offered a basic guideline to this patient case at 18 months postsurgery. Pain was monitored subjectively for changes before progressions were employed. This patient was eager to make progress and accepted each challenge with determination. One systematic review concludes resistive training is advocated for cancer patients.[14] As no specific limitations were identified by the physician at the time of initial referral, clinical decision making regarding exercise progressions was based on similar findings in the literature, experience, and patient response. A conservative approach was necessary as there were no clear guidelines to follow. The functional progress that was evident was the standard for measuring the success of the treatment plan; however, the final measurement of increased spinal range of motion was a red flag that there may be an underlying problem. Knowing that the patient had been referred with a slight shift to her fusion and a history of cancer, there was a possibility that the cancer could have recurred or something could have happened with the fusion. The most effective way of determining this was to have diagnostic testing done. Although as physical therapists we are considered experts in movement dysfunction, there are limitations to our capabilities in diagnosing pathology. This does not mean that we are limited in our abilities to provide sound clinical decisions regarding treatment. Physical therapists are capable of diagnosing pathology to determine the appropriateness of physical therapy for their patients because of time, education, and experience in managing patients with neuromusculoskeletal diseases.[15] As we are exposed to patients with more complex and rare diseases, our clinical decisions evolve. It is also important to note that diagnostic imaging combined with physical examination can be crucial to a patient's status. As Segal[16] envisions the future of physical therapy, imaging could be a potential predictor of functional success.

CONCLUSION

Chordoma is a rare type of cancer that can present similar to many types of back pain that are seen in most physical therapy clinics. Evaluating and treating a patient with this unusual form of cancer requires a willingness to be conservative and cautious. In spite of this, it is even more important to be wary of the possibilities of lumbar fusion failure even after sufficient time postsurgery. Perhaps more research into bone healing rates and the effects of postsurgical radiation would provide a better understanding of this phenomenon. Our role in caring for patients with seemingly fragile situations such as chordoma is to become as knowledgeable about their condition as possible. In this case, diagnostic imagery was the key to determining the cause of this patient's limited success. Though this patient's outcome was not optimal in this interim, her determination to improve her functional status was a catalyst to accessing the additional care she required.

ACKNOWLEDGEMENT

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PRESIDENT'S CORNER

(continued from page 7)

detailing the project's specific aims, significance, impact, and research strategy. The top three ranked proposals will be invited to submit full proposals. Upon review of the full proposals, the top proposal will be recommended for funding and a collaborative agreement between the investigators and the Section to establish the Clinical Research Network, with clearly defined milestones for continued funding.

COMBINED SECTIONS MEETING

The Combined Sections Meeting (CSM) is the premier meeting for physical therapists for continuing education and exchange of current research. Because of the quality of this meeting, the CSM has experienced tremendous growth from approximately 6,333 attendees when I assumed the position of President at the Combined Sections Meeting in Boston in 2007 to 9,094 attendees at the 2011 Combined Sections Meeting in New Orleans. This growth is not without pain. The Orthopaedic Section is committed to working with the other Sections and the APTA to ensure that CSM meets the educational needs and expectations of all of those who attend. To this end, the Orthopaedic Section advocated for a comprehensive review process to ensure the continued growth and success of CSM. Over the next year, representatives of all Sections, the APTA staff, and the APTA Board of Directors will meet with a facilitator to do a comprehensive review of CSM. The overall goal of the review process is to clarify roles, responsibilities, and decision-making authority on the future direction and management of CSM with the intention of maximizing the experience of attendees and the investment of Sections and APTA.

With the exponential growth of the Combined Sections Meeting over the last 4 years, it became necessary to change the location of the 2012 Combined Sections Meeting from Tampa to Chicago. Despite the potential for cold and snow, we expect the 2012 Combined Sections Meeting to provide an exceptional continuing education and networking opportunity. Beth Jones and the Education Committee and Lori Michener and the Research Committee have created a fantastic program. The structure of the meeting has changed to accommodate the growth, as well as permit individuals to attend as much programming as possible. All educational sessions will be in 2-hour time blocks with 30 minutes between sessions. The Orthopaedic Section will sponsor 4 concurrent sessions that run over the entire duration of the meeting in rooms that should be able to comfortably accommodate the number of individuals that want to attend each session. I encourage you to review the program for the Combined Sections Meeting as well as the preconference courses offered by the Orthopaedic Section (http://www.apta.org/CSM/Programming/Orthopaedics/).

HIGHLIGHTS FROM FALL ORTHOPAEDIC SECTION BOARD OF DIRECTORS MEETING

- The Board of Directors approved the creation of an Annual Orthopaedic Section Meeting starting in the spring 2013. The date and location for the meeting will be released at the Combined Sections Meeting in Chicago.
- An award for the "Best Orthopaedic Section Poster" was established and will be awarded for the first time at the 2012 Combined Sections Meeting.
- The Board of Directors voted to contribute $25,000 over 2 years to the Foundation for Physical Therapy to establish a grant related to Referral for Profit Research.
- A balanced budget for 2012, totaling $1,696,753 was approved.

In closing, I hope to see you at the Combined Sections Meeting in Chicago. As always, if you have questions or comments, please feel free to contact me at jirrgang@pitt.edu or through the Orthopaedic Section Office at (tdeflorian@orthopt.org). Best wishes for a successful year.

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Stanley V. Paris, PT, PhD, FAPTA

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Little Rock, AR	Furto	Apr 11 - 15
Atlanta, GA	Smith	Apr 12 - 16
Orlando, FL	Viti	May 16 - 20
Houston, TX	Yack	Jun 6 - 10
Asheville, NC	Furto	Jun 27 - Jul 1
Ft. Lauderdale, FL	Viti	Jul 18 - 22
Denver, CO	Yack	Jul 25 - 29
San Diego, CA	Smith	Aug 15 - 19
Las Vegas, NV	Yack	Sep 12 - 16
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Application of Regional Interdependence in a 20-Year-Old Male Collegiate Baseball Player with Recurrent Nonspecific Low Back Pain: A Retrospective Case Report

Ronald C. Miller, DPT, OCS[1]
William Hanney, DPT, MTC, ATC/L, CSCS[2]
Ian A. Young, PT, DSc, OCS, SCS, CertMDT[3]
Sheila H. Klausner, PT, MS, OCS, CSCS, MT[4]

[1]Florida Hospital Sports Medicine and Rehabilitation Orthopedic Resident, Florida Hospital Sports Medicine and Rehabilitation, Oviedo, FL
[2]Instructor, University of Central Florida, Department of Health Professions, Program in Physical Therapy, Orlando, FL
[3]Physical Therapist, Spine and Sport Physical Therapy, Savannah, GA
[4]Senior Physical Therapist, Florida Hospital Sports Medicine and Rehabilitation, Oviedo, FL

This case was seen at Florida Hospital Sports Medicine and Rehabilitation, Oviedo, FL. At the time of the case, Ron Miller was completing a residency in orthopaedic physical therapy.

ABSTRACT

Study Design: Case report. **Background:** The concept of regional interdependence has been applied by physical therapists for musculoskeletal pathologies; however, little evidence exists to support its effectiveness in patients with low back pain (LBP). The purpose of this case report is to further investigate the concept of regional interdependence in a patient with recurrent nonspecific LBP and evaluate the results of this treatment approach with regards to changes in pain and disability. **Case Description:** The patient was a 20-year-old male collegiate baseball player complaining of recurrent LBP for 6 months who failed prior conservative treatment. Interventions emphasized manual therapy to the hip and exercises to address hip and lumbar muscle weakness. The patient was treated 10 times over a 4-week period. Outcomes of pain, function, and disability were recorded at baseline and 2 weeks, and 4-week follow-up periods. **Outcomes:** At discharge, significant changes were revealed in the NPRS (Numeric Pain Rating Scale), MODI (Modified Oswestry Disability Index), and PSFS (Patient Specific Functional Scale). The patient had a favorable outcome and was able to return to sport specific training including baseball activities. **Discussion:** Although there is a paucity of evidence supporting the concept of regional interdependence in patients with LBP, this case study provides a description of its application and subsequent outcomes for changes in pain and disability in a patient with recurrent LBP. More rigorous research designs are needed to imply causation and determine long-term outcomes.

Key Words: low back pain, physical therapy, regional interdependence

INTRODUCTION

Low back pain (LBP) is a complex and heterogeneous condition that is one of the most common causes of disability for individuals of working age.[1-6] Low back pain has been reported to have high recurrence rates.[7] These recurrence rates have been theorized to be from: failure to regain lumbar muscle strength and multifidus hypertrophy,[8] high fear-avoidance beliefs,[9] genetics,[10] age-related degenerative changes to lumbar tissues,[10] improper biomechanics with activities,[11] poor aerobic endurance and fitness levels,[12] and distal lower extremity range of motion (ROM) and strength impairments.[11] The prevalence of distal lower extremity impairments for patients with recurrent LBP would highlight the concept of regional interdependence in patients and the functional relationship between the lumbar spine and lower extremity.[13-16]

DeRosa and Porterfield[4] initially suggested a concept that impairments including, joint hypomobility and muscle imbalance could create excessive stress on neighboring joints. This regional interdependence model suggests that seemingly unrelated impairments in a remote anatomical region may be associated with a patient's primary complaint.[17]

The concept of regional interdependence focuses on these impairments and is distinct from the phenomenon of referred pain.[17] Evidence supports the relationship between abnormal lower extremity biomechanics that may cause asymmetrical or excessive loading, and early degenerative changes in the lumbar spine.[13] A number of randomized control trials (RCT) have identified positive outcomes using this regional interdependence model with various orthopaedic conditions.[18-23] There is evidence supporting the regional interdependence approach in treatment of cervical pain,[19,24-26] shoulder pain,[18,20,27] lateral epicondylalgia,[28] knee osteoarthritis,[21,22,29,30] lumbar spine stenosis,[23] and knee pathology.[31,32]

Spine and hip movements are often coupled during many functional activities.[33] Flynn et al[34,35] developed a clinical predication rule (CPR) that identifies predictive clinical findings in patients with LBP who were more likely to benefit from spinal manipulation. One of the criteria in the CPR is that at least one hip exhibit greater than 35° internal rotation (IR) ROM, thereby identifying a possible relationship between the hip and LBP. Ellison et al[36] compared hip rotation in patients with LBP to those without LBP, and showed that patients with LBP more frequently demonstrated asymmetrical hip rotation ROM. Chesworth et al[37] also compared hip rotation ROM in patients with LBP to matched controls, and presented data that both IR and external rotation (ER) were significantly limited for patients with LBP when compared to subjects in the control groups. Furthermore, athletes with LBP who participate in sports that require rotation have less overall passive hip rotation motion and more asymmetry of

rotation between sides than persons without LBP.[38-40] The hip and lower extremity may affect the alignment of the spine through joint and muscle forces and may be correlated with LBP.[41] Studies have shown an association of LBP with hip ROM asymmetries. McGregor and Hukins[42] performed a critical review of the relevant biomechanical and clinical literature reporting evidence for involvement of the lower limb in spinal function and LBP. Scholtes et al[43] demonstrated that lower limb movements may be an important factor related to increased stress in tissues of the lumbar region and may lead to the development of persistent LBP. Ben-Galim et al[44] reported significant short- and long-term improvements in LBP and disability in patients receiving a total hip replacement. This study further supports a possible link between hip pathology and LBP.

Studies have also proposed a link between the presence of LBP and decreased muscle strength and poor neuromuscular control.[45-52] Muscles of the lumbar and hip regions play an integral role in the kinetic chain by providing dynamic stabilization and optimal neuromuscular control of the lumbo-pelvic-hip complex.[45] Muscle imbalances in one segment of the kinetic chain may influence the lumbopelvic movement system and may cause compensatory movement patterns, possibly contributing to LBP.[46] Patients with LBP have been shown to have altered recruitment strategies in the lumbo-pelvic-hip complex.[47-50] Nadler et al[51] showed a significant difference in side-to-side symmetry of hip strength observed in female subjects who reported a lower extremity injury or LBP as compared to those who did not. Kankaanpaa et al[52] presented data from EMG fatigue analysis showing that the gluteus maximus muscles are more fatigable in patients with chronic LBP than in healthy controls. Nourbakhsh and Arab[53] also showed a significant association among patients who had LBP and weakness in the back extensor, abdominal, and hip muscles. These aforementioned studies support the concept of regional interdependence between the hip and lumbar spine function in patients with LBP.

However, research supporting regional interdependence in patients with LBP has often used non-experimental designs that lack a control group and also valid outcomes measures. Two case reports[16,54] have demonstrated a successful decrease in LBP and increased function with treatment guided towards impairments of the hip. One randomized controlled trial (RCT) by Whitman et al[23] showed greater perceived recovery and decreased disability in patients with lumbar spinal stenosis, when manual therapy was implemented. The purpose of this case report is to investigate the concept of regional interdependence in a patient with recurrent nonspecific LBP that failed prior conservative treatment and correlate the results of this treatment approach to changes in pain, function, and disability.

CASE DESCRIPTION

History

The patient is a 20-year-old male collegiate baseball player complaining of recurrent LBP for the past 6 months. He reports initially sustaining the injury when swinging a bat during the spring season, and he continues to experience intermittent LBP with running, weightlifting, and baseball activities. Previous conservative medical care by the intercollegiate athletic training staff was unsuccessful, and his LBP symptoms persisted. The patient states he is currently taking an anti-inflammatory and a muscle relaxer. He reports no current radiograph or magnetic resonance images prior to referral. No significant past medical history and absence of direct lumbar trauma was noted. Currently, the patient reports LBP that radiates into his right buttock and hip. The patient's goal is to be ready for baseball when returning to school in the fall.

Evaluation

The patient completed a variety of self-report measures, followed by a standardized history and physical examination performed by a physical therapist. Self report measures included a body diagram to assess the distribution of symptoms, numeric pain rating scale (NPRS), the patient specific functional scale (PSFS), and the Modified Oswestry Disability Questionnaire (MODI). The NPRS asks the patient to rate the level of pain on a 0 to 10 scale, with 0 indicating no pain and 10 indicating the worst imaginable pain. The minimum clinically importance difference (MCID) for the NPRS is 2 points, indicating a patient should show a 2 point reduction to demonstrate a clinically meaningful change.[55] The PSFS is used to quantify activity limitation and measure functional outcomes. The patient was asked to identify 3 important activities that he was unable to do or was having difficulty with as a result of his LBP. The patient was then asked to rate the difficulty with each activity on a 0-10 scale: 0 indicating he is unable to perform activity and 10 indicating he is able to perform the activity at the same level as before his injury. The total score equals the sum of the activity scores divided by the number of activities. The MCID of 2 points has been reported for certain musculoskeletal injuries.[56,57] The PSFS has been demonstrated to be reliable and valid in patients with LBP.[57] The MODI was used to measure disability and consists of 10 questions. Each question is scored from 0 to 5, with higher scores indicating greater disability. The scores were then converted to a percentage score. The reliability, validity, and responsiveness of the MODI are well established.[58] Initial pain and outcome measure scores can be found in Table 1 and 2.

A biomechanical assessment and functional screen was performed and showed no abnormalities in gait, squatting, single leg stance, or any significant findings at the foot and knee joints. Functional strength of the lower extremity was assessed with single leg squatting.[45] The patient was able to perform 10 repetitions of single leg squatting on both lower extremities with a mild bilateral genu valgus noted. In standing, the patient did present with an excessive lumbar lordosis. Lumbar active ROM in all planes was within normal limits (WNL); however, extension and bilateral rotation reproduced his symptoms of low back and gluteal pain.

Examination of the patient's hips showed significant asymmetries. Range of motion was assessed with a goniometer for internal and external hip rotation while in the prone position. Initial hip IR and ER measurements can be found in Table 3. The muscle flexibility of the iliopsoas was assessed indirectly using the Thomas test described by Kendall et al,[59] and right and left measures were lacking normal flexibility. The Thomas test can also be used to assess length of the rectus femoris, iliotibial band, and tensor fascia latae muscles along with iliopsoas length;[60] however, it is currently untested for diagnostic value.[61] Distal bilateral measures for the knee and ankle were unremarkable for any ROM, muscle flexibility, and dysfunction.

Muscle strength using previously cited manual muscle testing procedures were assessed for the hip abductors, extensors, internal rotators, external rotators, and iliopsoas.[59] Manual muscle testing (MMT) has not showed consistent high levels of reliability and validity;[45] however, a recent lit-

Table 1. Self Report Measures of Pain, Function, and Disability

	Initial	2 Weeks	Discharge
Pain (NPRS)	2	0	0
Function (PSFS)	4	NA	7.33
Disability (MODI %)	20	14	8

NPRS, Numeric Pain Rating Scale; PSFS, Patient Specific Functional Scale; MODI, Modified Oswestry Disability Index

NPRS, 0-10 scale; PSFS, 0-10 scale; MODI, 0-100% scale

Table 2. Patient Specific Functional Scale

Activities	Initial	Discharge
1. Prolonged standing	6	8
2. Baseball (hitting, throwing, etc)	1	7
3. Running	5	7

Scoring: 0 = Unable to perform activity, 10 = Able to perform activity at same level as before injury or problem

Table 3. Impairment Outcomes

Hip Passive ROM		Initial	Discharge
Internal Rotation	R	25	45
	L	30	35
External Rotation	R	50	50
	L	30	50
Manual Muscle Testing		**Initial**	**D/C**
Iliopsoas	R	5/5	5/5
	L	5/5	5/5
External Rotation	R	5/5	5/5
	L	5/5	5/5
Internal Rotation	R	4/5	5/5
	L	4/5	4+/5
Gluteus Medius	R	4/5	5/5
	L	4/5	5/5
Gluteus Maximus	R	4/5	5/5
	L	4/5	4+/5

erature review showed good reliability and validity in the use of MMT for patients with neuromusculoskeletal conditions.[62] Manual muscle testing during the evaluation indicated bilateral hip muscle weakness in the hip internal rotators, extensors, and abductors (Table 3).

Palpation of the lumbar spine in prone was unremarkable. Central posterior-anterior segmental mobility testing was remarkable for L5 dysfunction and reproduced his LBP. The following screening and special tests were unremarkable or negative: lower quarter scan, deep tendon reflexes, slump test, straight leg raise, well straight leg raise, centralization of symptoms, and pain provocation testing for the clinical prediction rule (CPR) for sacroiliac joint pathology as described by Laslett et al.[63] These findings supported the differential diagnosis and ruled out other mechanical sources of LBP such as: lumbar discogenic and sacroiliac joint pathologies. The majority of special tests for the lumbar spine and hip have demonstrated poor diagnostic value,[61] but these tests were selected based on sensitivity, specificity, and likelihood ratios to better rule in or rule out certain lumbo-sacral pathologies and increase diagnostic accuracy.

Diagnosis

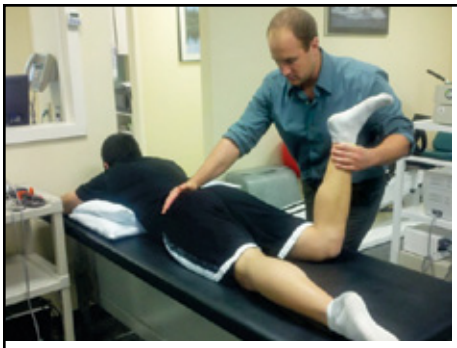
Nonspecific LBP has been defined as LBP localized below the costal margin and above the inferior gluteal folds.[64] Patients with radicular signs and symptoms below the knee have been shown to have an increased probability of diskogenic pathology.[65] The patient demonstrated a lack of centralization of symptoms with repeated movements and did not present with radicular symptoms below the knee, so lumbar radiculopathy was ruled out. The CPR for sacroiliac joint pathology was negative. The authors hypothesized that with the noted lumbo-pelvic-hip impairments, an increase in posterior loading on the lumbar spine was occurring especially during functional and sport activities. This potentially caused increased stress to the lumbar region, contributing to the patient's current LBP. After implementing the above special tests and ruling out other pathologies, a diagnosis by exclusion of recurrent nonspecific LBP was given.

Interventions

The selection of specific manual physical therapy interventions, exercise techniques, and patient education was based on the underlying impairments identified by the treating physical therapist. The therapist instructed the patient in specific exercises to address impairments in hip mobility and strength. All exercises were performed in the clinic and also were part of a home exercise program (HEP). In addition to the HEP, the patient was educated on posture and body mechanics, and instructed to avoid aggravating activities and sport specific training for the first two weeks, and to avoid lumbar hyperextension.

Manual Therapy Interventions

Manual therapy consisted of nonthrust joint mobilization techniques and manual stretching to improve hip impairments, capsular and soft tissue tightness, and flexibility of the iliopsoas. Specific manual therapy techniques included: contract-relax hip IR and ER stretches, hip lateral distraction with belt with rotation, long axis distraction, iliopsoas release, and hip flexor stretches using the Thomas test position. Stretching techniques were performed for 3 to 4 times with each stretch lasting 30 seconds. Manual

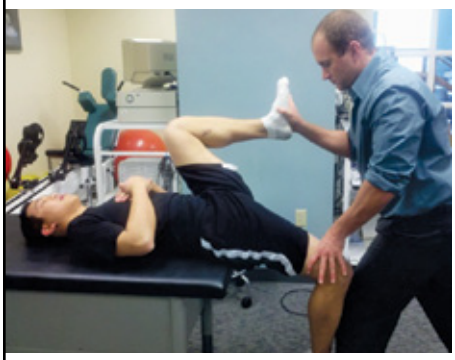


Contract-relax hip internal and external rotation stretching.

Long axis distraction.

Hip lateral distraction with belt with rotation.

Iliopsoas release.



Thomas test stretching.

Figure 1. Manual therapy interventions.

therapy was used in conjunction with therapeutic exercise to regain normal hip active ROM and to address muscle weakness impairments. The interventions did not include manual therapy to the lumbar spine which highlights how a regional interdependence model may have contributed to the outcome. Manual therapy interventions are shown in Figure 1.

Exercise Interventions

Exercise therapy focused on addressing bilateral hip muscle weakness and lumbar motor control. Initial exercises focused on neuromuscular re-education of lumbar and hip muscles. Exercises were then progressed to more complex and functional motor patterns. The specific exercise program consisted of; side lying resisted internal and external hip rotations, quadruped alternating upper and lower extremities with isometric holds, single leg bridging with neutral pelvis, side planks, single leg squats, lateral lunges, low row with lunge, and D1/D2 lumbar rotations with cable. Repetitions were started at 3 sets of 10 repetitions (3 x 10) each, then progressed to 3 x 20, and then resistance was progressed. Exercises were also given as part of the home exercise program. Exercise interventions are shown in Figure 2.

Outcomes

The patient was seen 10 times over a 4-week period before returning to school. At 4 weeks discharge, the patient reported no LBP on the NPRS with daily activities and was able to return to sport specific activities with only minor complaints of intermittent LBP. Significant changes were shown in all pain and disability outcomes measures. Initial and discharge scores can be found in Tables 1 through 3. Initial MODI score was 10/50 (20% disability) and discharge MODI was 4/50 (8% disability). It is noted that the patient showed a reduction greater than 50% in the MODI, which served as a successful outcome in other studies[34,35] Initial overall PSFS score for the patient's 3 activities was a 4.0. At 4-week discharge, the patient's score was 7.33, which shows a significant function change occurred with an increase in the total PSFS score above the MCID of 2 points.[56] Upon discharge, the patient was encouraged to report to his athletic trainer to continue with his treatment program throughout the baseball season to further decrease his LBP with sport specific activities.

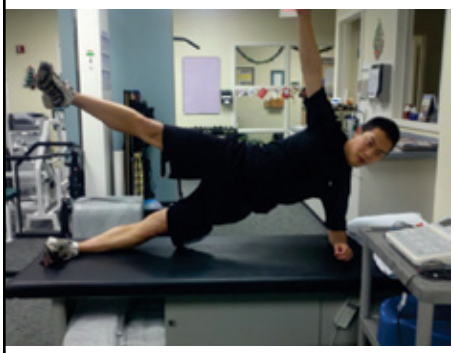
DISCUSSION

Physical therapy interventions based on the concept of regional interdependence for the treatment of musculoskeletal conditions are becoming more popular. A regional interdependence model primarily focuses on impairments present in proximal or distal segments associated with the patient's primary complaint.[17] Physical therapists can diagnose movement disorders associated with LBP by analysis of posture, lower extremity kinematics, adaptive changes resulting in altered spinal mechanics, and patterns of muscle weakness that lead to abnormal loads being placed on the spine.[4] Recent advances in research have begun to indicate the importance of this regional approach to musculoskeletal examination.[17] During the initial examination, posterior to anterior lumbar joint mobilizations reproduced the patient's symptoms showing dysfunction at the lumbar spine. By addressing hip ROM and strength impairments distal to the lumbar spine, the patient was able to return to sport and baseball activities, which may have resulted in decreased loading to the spine. The patient could have continued to benefit from physical therapy services, but he returned to school for the fall semester. Current evidence does suggest a relationship between proximal and distal regions of the musculoskeletal system,[41] but lacks high quality research studies in patients with LBP. This case highlights the importance of addressing distal hip impairments in a patient with recurrent nonspecific LBP.

Sidelying resisted internal and external hip rotations.

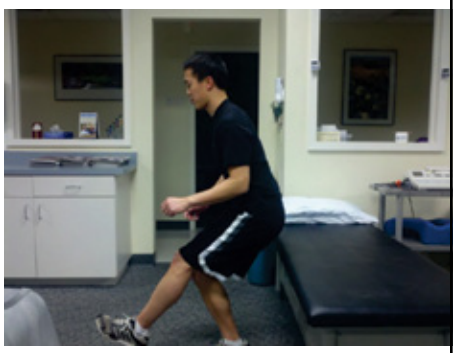
Single leg bridging with neutral pelvis.

Sidelying straight leg raise.



Side planks with SLR.

Quadruped alternating upper and lower extremities.



Single leg squats.

Lateral lunges.

Low row with lunge.

D1/D2 lumbar rotations with cable.

Figure 2. Therapeutic exercises.

Although prior conservative treatment was ineffective, this patient was able to return to sport specific activities after a 4-week intervention focusing on the regional interdependence model. Outcomes including the NPRS and PSFS were greater than the defined minimum clinically important difference, and a greater than 50% reduction in disability was shown with the MODI resulting in a clinically significant change in pain and disability. The use of standardized outcome measures are recommended and gaining increased popularity in clinical practice.[66] Many authors question the interpretation of these scores but still recommend outcome measures for patients with LBP. Outcomes measures for patients with LBP should meet several psychometric criteria and require further analysis to attain the proper minimum clinically importance difference values.[67] To further support the usage of standardized outcome measures, Pengel et al suggest that more emphasis be placed on the changes in pain and disability scores rather than the change in physical impairments when looking at outcomes in patients with LBP.[66] Results from this case report should be interpreted with caution and conclusions of cause and effect cannot be made directly between changes in hip impairments and the changes in outcomes with this being a case report. The results of this case study have applied the regional interdependence model in a patient with recurrent LBP and found a correlation to positive outcomes with regard to changes in pain and disability. A more stringent experimental design is needed to fully support the concept of regional interdependence. Further research is needed.

CONCLUSION

Clinically significant changes were seen in LBP and disability when a regional interdependence treatment approach was applied to a patient with recurrent nonspecific LBP that had failed prior conservative treatment. Future research should investigate a regional interdependence model in patients with LBP with quality RCTs using long term outcomes in pain and disability.

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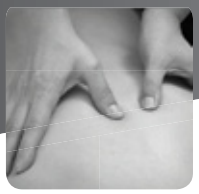

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Relationship Among Performance on the Selective Functional Movement Assessment and NDI and ODI Scores in Patients with Spine Pain

Sarah Beth Pilch, PT, DPT
Kelly Rodriguez, PT, DPT
Kevin Rudolph, MS, PT
Nicole Swiatek, MS, PT, FAAOMPT
John Paul Zawisky, PT, DPT
Ronald J. Schenk, PT, PhD, OCS, FAAOMPT, CertMDT[1]

[1]Department of Physical Therapy, Daemen College, Amherst, NY

ABSTRACT

Study Design: Correlational study. **Objective:** To determine whether the Selective Functional Movement Assessment (SFMA) relates to the perceived level of function in patients who are treated for neck or low back conditions. **Background:** Although the Functional Movement Screen (FMS) has been found to be a reliable tool, the relationship between the related SFMA and the perceived level of function of patients with spine pain has not been determined. **Methods and Measures:** Ten patients between the ages of 28-74 were recruited and asked to complete the Neck Disability Index (NDI) and/or the Oswestry Disability Index (ODI), followed by a thorough physical therapy initial evaluation, which included the Selective Functional Movement Assessment. **Results:** Correlation analysis showed a significant relationship between the scores of the NDI and SFMA (r_s = 0.824) establishing a preliminary positive relationship between patients' perceived level of function and the SFMA. **Conclusion:** The results indicate the potential for functional assessment tests being used in combination with an established perceived level of function scales to document the progression of a patient's strength, tolerance, and performance abilities during rehabilitation.

Key Words: function, neck pain, low back pain

INTRODUCTION

Although the goal of physical therapy (PT) is to improve the patient's functional status, the PT examination does not often incorporate functional testing. This may be due to a focus on measuring impairments as well as the lack of evidence supporting functional testing. A functional progression for return to activity can be developed by simulating specific activities and then performing them in a sequence that allows for acquisition or requisition of skill.[1] It is efficient and appropriate to look at gross movement patterns for the presentation of limitation and asymmetry in order to use consistent and reliable systems to assist in deductive problem solving.[2] Functional tests for the spine include the Functional Movement Screen (FMS) and the Selective Functional Movement Assessment (SFMA), and also self-report functional outcome measures, which include the Neck Disability Index (NDI) and the Oswestry Disability Index (ODI).

Two widely used tools are the ODI and the NDI, which are measures of function that quantify a patient's perceived disability level. The ODI has become one of the principle condition-specific outcome measures used in the management of spinal disorders.[3] The 10 sections of the ODI include (1) pain intensity, (2) personal care, (3) lifting, (4) walking, (5) sitting, (6) standing, (7) sleeping, (8) sex life, (9) social life, (10) traveling.[3] These items do not assess the patient's movement on a functional level; rather they address this inadequacy by maintaining that this tool measures a dimension different from that measured by the questionnaires.[3] The ODI may not be as useful alone as it can be in conjunction with a functional movement test, and the scores can be compared.[4]

The NDI provides a useful, reliable, and valid way of measuring the clinical outcome of patients with neck pain. The NDI is a 10-item questionnaire based on the Oswestry Low Back Pain Index that assesses disability associated with neck pain and whiplash.[5] There are 4 items that relate to subjective symptomatology (pain intensity, headache, concentration, sleeping) and 6 items that relate to activities of daily living (lifting, working, driving, recreation, personal care, reading).[5] Results indicated that NDI changes of 10 points to be clinically meaningful for patients with mechanical neck pain presenting both with and without concurrent UE symptoms.[6] The interpretation of these results warrants other functional assessment tools.

The FMS is a systematic evaluation of a patient's movement pattern quality.[7] The FMS is an assessment that is supported by research on asymptomatic individuals and is a simple and quantifiable method of evaluating basic movement abilities.[7] A key factor of the FMS is that it is not intended to diagnose orthopaedic problems but rather to demonstrate limitations or asymmetries in healthy individuals with respect to basic movement patterns and eventually correlate them with sport performance outcomes.[7] The FMS is comprised of 7 fundamental movement patterns that include (1) deep squat, (2) hurdle step, (3) in-line lunge, (4) shoulder mobility, (5) active straight leg raise, (6) trunk stability push up, and (7) rotary stability. Each of the 7 items requires a balance of mobility and stability. The FMS is unique in that each test movement places the patient in functionally challenging positions where weaknesses and imbalances become noticeable if appropriate stability and mobility are not used.[7] The FMS is scored from 1-3 whereby 3 represents ideal performance with proper alignment, 2 represents faults in the performance of the activity, and 1 represents inability to perform the activity without significant compensation. This would include scoring both extremities. Minick et al[8] studied the interrater reliability of the FMS. In this study, the 7 movement tests use a variety of positions and movements closely related to normal growth and development. It is conceptualized that fundamental movements such as those within the FMS operate on the basis of more complex movement patterns used in common daily activities and sports.[8] All 7 movement patterns are considered together as a comprehensive cross section of functional movement. In order to establish the reliability, the scores of two experts were compared as were the results of two novices.[8]

The data indicated that the FMS has high inter-rater reliability and can be confidently applied by trained individuals when the standard procedure is used.[8]

An appropriate diagnosis and treatment following injury are essential to return an athlete quickly and safely to sports. However, before an athlete returns, it is important to determine his/her level of readiness to meet the functional demands of the sport with minimal risk of reinjury or compensatory injury. Hickey et al[9] focused on injuries resulting from lower extremity (LE) asymmetries in strength and functional abilities in an athletic population. The use of a functional movement assessment is warranted because functional performance tests, which measure LE asymmetry, may help to identify healthy athletes who are at risk for LE injury.[9] When the FMS is used on the movement pattern of athletes, it can drive the interventions for performance enhancement. In a study conducted by Hickey et al, dynamic field tests were used in the combined event of the National Football League (NFL), an assessment of NFL athletes based on their skills and abilities.[9] The purpose of this research was to provide field testing methodology designed to isolate LE asymmetry and to demonstrate the potential for these tests to provide reliable measures.[9] Hickey et al concluded that using a single test in isolation may not adequately simulate all of the challenging movements an athlete may encounter on the playing field.[9] Thus, incorporation of several different types of functional assessment tests are important when evaluating an athlete's return to sport.[9] The findings can be clinically generalized to treating any patient in the field of physical therapy. Quantitative measurements, such as functional assessment tests, can be used to document the progression of a patient's strength, tolerance, and performance abilities during rehabilitation.

When evaluating or treating a patient, an isolated approach focusing on single joint motions may not relate to overall function. Functional restoration requires knowledge and assessment of dysfunctional and functional patterns of movement to gain clinical perspective and design an effective treatment strategy.[10] According to Dr. Shirley Sahrmann, there are many changes in movement patterns that cause specific muscle weakness.[10] "The relationship between altered movement patterns and specific muscle weaknesses requires that remediation addresses the changes to the movement pattern; the performance of strengthening exercises alone will not likely affect the timing and manner of recruitment during functional performance."[10] Dr. James Cyriax created a systemic method for classification of contractile tissue quality based on tension and irritability.[10] Cyriax demonstrated how a small amount of qualitative tests could refine the examination so that more involved quantitative tests could confirm, refine, and rate the identified problem.[10] The Cyriax model helps to lay the framework for the SFMA.[10] In his model, also referred to as selective tension testing, information related to the quality of passive and resisted movement behavior is used to refine the diagnosis to a soft tissue structure.[10]

Similar to the Cyriax sequence of diagnostic movements, the SFMA assesses the patient's response to movement. The SFMA ordinal scores the functional movements as functional and nonpainful, functional and painful, dysfunctional and nonpainful, and dysfunctional and painful.[10] The term functional describes any unlimited or unrestricted movement.[10] Dysfunctional describes movements that are limited or restricted in some way demonstrating a lack of mobility, stability, or symmetry within a given functional movement.[10] The SFMA should identify mobility and stability problems throughout the system.[10] To identify these problems, the following movements occur: Multisegmental flexion, multisegmental extension, multisegmental rotation, deep squat, single leg stance, cervical movement patterns, and upper extremity movement patterns. These movement tests comprise the SFMA and were utilized in this study and are shown in Figures 1-7. Many components comprise pain-free functional movement including adequate posture, range of motion, muscle performance, motor control, and balance reactions.[10] Impairments of each component could potentially alter functional movement resulting in or as a consequence of pain.[10]

One primary goal of physical therapy is to return patients to their previous level of function. According to current best evidence, there is not a standardized tool to assess a patient's general level of function during an exam. Although the SFMA appears to be clinically useful, evidence regarding reliability and validity of this measure has not been established. While current approaches and functional outcome measures have been analyzed, it is still unknown whether there is a correlation between a functional exam and a patient's functional level.

METHODS

Subjects

Potential candidates for participation in this study were referred for treatment of neck or low back pain (LBP) indicating that they met the criteria for a successful response to physical therapy. All participants were required to be over the age of 18, and exclusion criteria included the following: history of spinal surgery, progressive disease process, psychological illness, pregnancy, symptoms relative to cauda equina syndrome, inability to understand English, engaged in litigation related to spinal pain, and insurance through no fault or workers compensation.

Figure 1. Multisegmental flexion.

Figure 2. Multisegmental extension.

Figure 3. Multisegmental rotation.

Figure 4. Deep squat.

Figure 5. Single leg stance.

The study was approved by the Daemen College and Catholic Health System Institutional Review Boards.

An initial evaluation was conducted on a total of 14 patients at 2 local outpatient clinics; however, due to incomplete data collection only 10 were included in the data analysis. These 10 patients ranged from 28-74 years of age, with a mean age of 49.3± 17.6. Data were collected on each patient at initial evaluation, while only 8 patients had data collected upon reevaluation, and 2 patients upon discharge evaluation. One patient completed both the NDI and ODI; therefore, 21 entries were available for data analysis. Of the 21 entries, 16 measurements were scores generated by the NDI and 5 measurements were scores generated by the ODI.

Procedures

After informed consent was obtained, the patients were asked to fill out either the ODI or NDI, which were used to determine how well they can perform daily functions in relation their neck or LBP. The Verbal Rating Scale (VRS) was also used to see how the patients rated their level of pain on a 0-10 scale.

Following completion of these forms, the patients underwent a PT examination by a licensed physical therapist, which included the following: a subjective examination (history), postural exam, and range of motion of the spine, dermatomal and myotomal testing, superficial sensation, a straight leg raise, spinal joint mobility, and the SFMA. The individual tests were stopped if there was a demonstrated inability or safety consideration or at the first point of reported pain. All finding were recorded on a provided data collection sheet. Following the examination, patients received PT as prescribed by their physical therapist and/or referring physician. The functional questionnaire and physical functional tests were administered and reassessed at the initial examination, 2 weeks following the initial examination, and at discharge.

Statistical analysis

The 10 participants yielded 21 measurements for data entry. Of the 21 entries, 16 measurements were scores generated by the NDI and 5 measurements were scores generated by the ODI. Generated scores from both the NDI and ODI would be compared to the scores generated from the SFMA using a Spearman's Rho correlation analysis.

RESULTS

SFMA vs. NDI

Spearman's Rho correlation analysis yielded a correlation coefficient (r_s) of .82, indicating a significant relationship between the scores of the NDI and the SFMA. Table 1 is a depiction of the output from this correlation analysis and Figure 8 illustrates a representation of the correlation between the two measurement tools.

SFMA vs. ODI

Spearman's Rho correlation analysis yielded a correlation coefficient (r_s) of .58, indicating that there is a low correlation between the scores of the ODI and those of the SFMA, but that the relationship was not statistically significant. Table 2 shows the output from this correlation analysis and Figure 9 depicts the low correlation between the two screening tools.

DISCUSSION

This study investigated the patients' perceived level of function compared with the functional movements of the SFMA. The fundamental movement patterns such as those assessed by the SFMA can be easily incorporated clinically into a physical exam. This study demonstrated that there is a correlation between patients' perceived level of function and the functional movements of the SFMA, scores of the NDI and SFMA (r_s=0.82), and the scores of the SFMA and the ODI (r_s=.58). In comparison to the current literature, the ODI has been used in previous studies to assess the patient's perceived level of function. A study by Chen et al[11] focused the examination based on the patient's impairment, but did not include assessments of the patient's perceived level of function. Chen et al[11] concluded that matching exercise with the direction of preference assists in the pain reduction and recovery of function while allowing for self management of the patient's condition. The conclusion from this research provides evidence to

Figure 6. Cervical movement patterns.

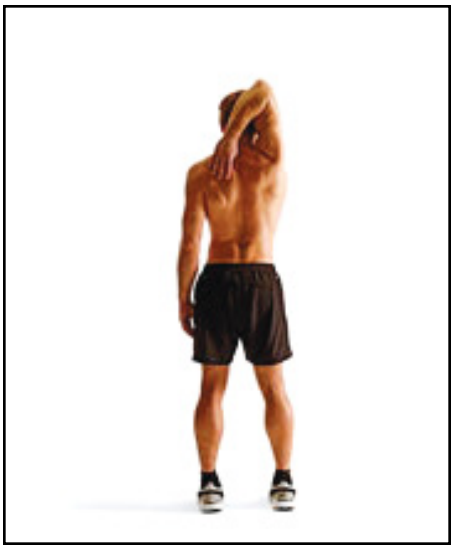

Figure 7. Upper extremity movement patterns.

support the use of the SFMA, which is to identify the most dysfunctional nonpainful movement pattern and break the pattern down to identify the underlying cause of the dysfunction.[10] In a study by Young et al,[6] the NDI appeared to demonstrate adequate responsiveness based on statistical reference criteria when used in a sample that approximates the high percentage of patients with neck pain and concomitant upper extremity (UE) referred symptoms. Relevant findings found that NDI changes of 10 points to be clinically meaningful for patients with mechanical neck pain presenting both with and without concurrent UE symptoms.[6] Preliminary support is provided from this research to justify the inclusion of UE movements to be incorporated into a functional exam when compared to the patient's perceived level of function. En et al[12] stated that the potential limitation of these questionnaires, and others with fixed questions, is that they constrain the scope of the evaluation to the specific issues included; therefore, the questionnaire may include questions not relevant to some patients, and may not include issues of importance. Findings from this cross-sectional survey of 20 subjects with chronic, nontraumatic neck pain supported the content validity of using both the NDI and the Neck Pain and Disability Scale questionnaires for measuring disability in this population.[12]

Van Dillen et al[13] investigated the relationship between active limb movements and patient's symptoms of LBP. Findings showed that active limb movements did affect a person's LBP while also relating to a person's perception of their pain level and how their LBP affects their ability to perform functional activities.[13] Additionally, Van Dillen et al,[13] provided evidence that active limb movements tested within the context of an examination can evoke symptoms in patients with LBP regardless of the stage of the patient's LBP episode.

A similar assessment tool to the SFMA is the FMS, which examines a patient at a functional level to help demonstrate limitations or asymmetries in healthy individuals with respect to basic patterns and eventually correlate them with outcomes.[7] The FMS is comprised of 7 functional movement patterns with the exception of no cervical head movements.[7] Minick et al[8] studied the interrater reliability of the FMS. The data indicated that the FMS has high inter-rater reliability and can be confidently applied by trained individuals when the standard procedure is used.[8] The FMS is based on the movement patterns of the individual being examined and is used to drive the interventions for performance enhancement.[8] Hickey et al[9] concluded that using a single test in isolation may not adequately simulate all of the challenging movements an athlete may encounter on the playing field. Thus, incorporation of several different types of functional assessment tests are important Dr. Shirley Sahrmann and Dr. James Cyriax have established the ground work for the SFMA to become a valuable tool used to screen patients in a physical therapy exam.[13] According to Dr. Shirley Sahrmann, "The relationship between altered movement patterns and specific muscle weaknesses requires that remediation addresses the changes to the movement pattern; the performance of strengthening exercises alone will not likely affect the timing and manner of recruitment during functional performance."[13] The faulty movement pattern that is identified is utilized in intervention by performing the activity with appropriate spinal stabilization.[13] The Cyriax model helps to lay the framework for the Selective Functional Movement Assessment (SFMA).[10]

This pilot study points toward the need for future research in this area. Limitations to this study included the small sample size and limited familiarity of the examiners with the SFMA measurement tool. Although the physical therapists participated in an in-service on the evaluation process using the SFMA, ODI, and NDI, the clinicians were not certified in SFMA through the Functional Movement Systems Clinical Education Series. Secondary to this limitation, incomplete data collection in 4 of the 14

Table 1. Correlations for NDI and SFMA

		SFMA	NDI
Spearman's rho SFMA	Correlation Coefficient	1.00	.82 **
	Sig. (2-tailed)	.	.00
	N	16	16
NDI	Correlation Coefficient	.82 **	1.00
	Sig. (2-tailed)	.00	.
	N	16	16

** Correlation is significant at the 0.01 level (2-tailed).

SFMA, Selective Functional Movement Assessment
NDI, Neck Disability Index

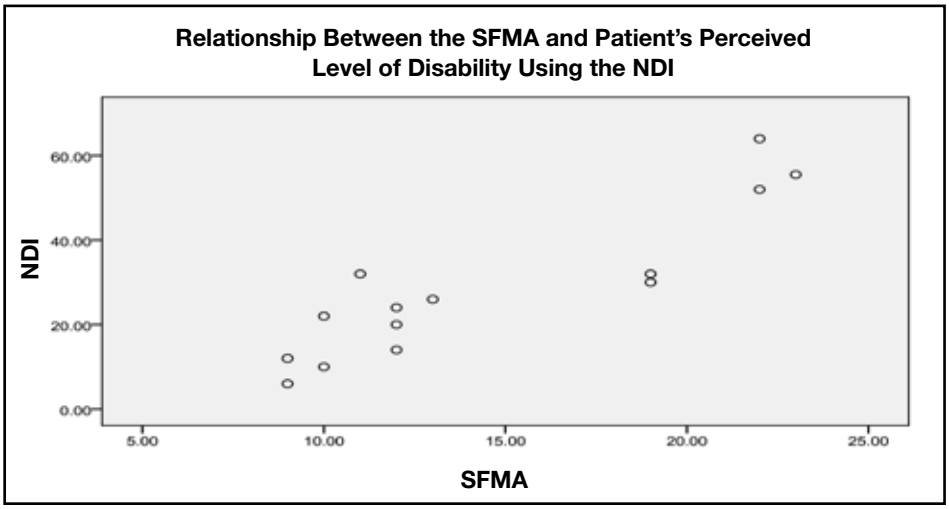

Figure 8.

Table 2. Correlations for ODI and SFMA

		SFMA	NDI
Spearman's rho	SFMA Correlation Coefficient	1.00	.82 **
	Sig. (2-tailed)	.	.00
	N	16	16
	NDI Correlation Coefficient	.82 **	1.00
	Sig. (2-tailed)	.00	.
	N	16	16

** Correlation is significant at the 0.01 level (2-tailed).

SFMA, Selective Functional Movement Assessment
NDI, Neck Disability Index

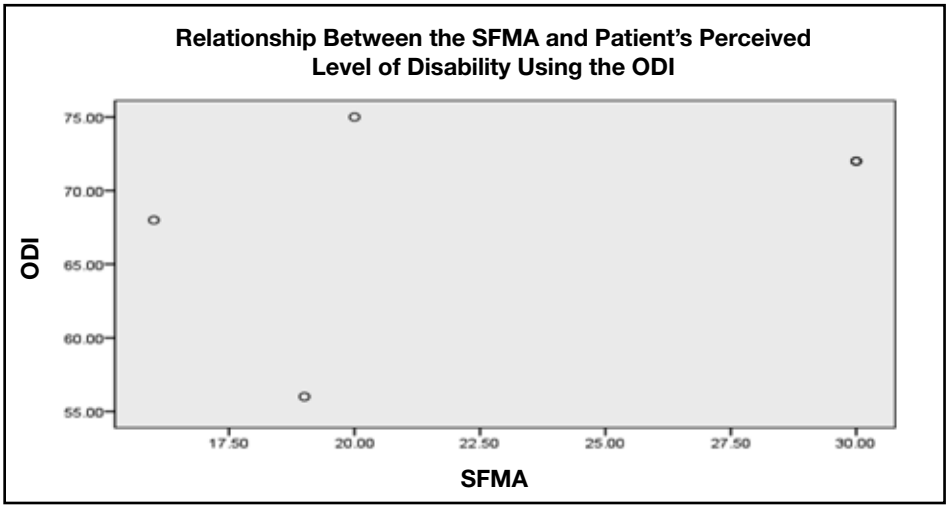

Figure 9.

patients occurred. The missing data did not include the functional cervical neck movements, which are an integral portion of the SFMA tool. Without the cervical neck movements, a correlation cannot be made with the perceived functional movements of the NDI and an overall score on the SFMA cannot be achieved.

CONCLUSIONS

A goal of physical therapy is to return patients to their previous or optimal level of function. When evaluating or treating a patient, an isolated approach by itself will not restore whole function.[14] In order to determine the patient's level of function, a standardized tool would be useful to assess a patient at a functional level during the examination process.[3] Both the Neck Disability Index and the Oswestry Disability Index are functional measures of perceived level of function; they are best used when paired/compared with a functional movement assessment.[3,5] Hickey et al[9] concluded that his findings can be clinically generalized to treating any patient in the field of physical therapy. Quantitative measurements, such as functional assessment tests, can be used to document the progression of a patient's strength, tolerance, and performance abilities during rehabilitation.

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Clam Shells: A Unique Progression for Hip External Rotation Muscle Strengthening

Dawn T. Gulick, PhD, PT, ATC, CSCS

Professor, Widener University, Chester, PA

ABSTRACT

Prescription of therapeutic exercises are an important component of physical therapy. Establishing a therapeutic progression to challenge a client to his/her maximal potential is essential. The purpose of this manuscript is to identify a series of exercises designed to challenge the hip external rotators. This progression of the clam shell exercise is based on physiologic principles and is sequenced as follows: supine, sidelying, supine bridge, and sidelying plank. Emphasis is placed on proper technique, hip position, and eccentric control.

Key Words: clam shell exercise, hip external rotation strengthening

INTRODUCTION

Physical therapists prescribe therapeutic exercise to address impairments in range of motion, strength, and function. Identification of the correct exercise(s) for a given impairment is essential for an efficacious treatment. Patellofemoral pain syndrome (PFPS) and anterior cruciate ligament injuries have been associated with a decrease in hip external rotation (ER) strength.[1-5] Lack of ER strength can result in a valgus moment at the knee. Failure to control valgus moments can increase the risk of knee injury.[5] Tasks such as lunges, "fire hydrants," standing hip abduction, mini-squats with external rotation, and "clam shells" are often prescribed to target the hip external rotators. The purpose of this manuscript is to couple components of well-known exercises to provide a creative therapeutic progression for maximal muscular recruitment. The motion targeted is hip ER. These tasks involve challenging activities that require movement against resistance while maintaining a stable core.

THERAPEUTIC PROGRESSION

As stated, "clam shells" challenge the hip external rotators. This exercise is typically performed in a supine (Figure 1) or sidelying position (Figure 2). In supine, the client flexes the hips/knees in order to place the feet flat on the mat. The knees are separated into a position of hip abduction and ER. In sidelying, the lower extremities are placed on top of each other (stacked) and the hips/knees can be in varying degrees of flexion. The superior lower extremity is then moved into an abducted and externally rotated position by separating the knees while the ankles remain approximated. Despite the use of an elastic band for resistance, the supine clam shell tends to be the easier of the two exercise methods for several reasons. First, in the supine position, the trunk is stabilized by body weight. In addition, the supine task incorporates symmetrical, bilateral motion in contrary to the sidelying task that requires an isometric contraction of the inferior leg with a concentric contraction of the superior leg. The movement of the legs is also assisted by gravity in the supine position.

Given the trunk stabilization and the gravity eliminated position, the supine clam shell would be the first exercise in the therapeutic progression. This would be followed by the sidelying clam shell. In sidelying, attention should be on keeping the shoulders and pelvis perpendicular to the mat surface. Once the client is able to perform these tasks without form fatigue, the next exercise in the sequence would be a clam shell bridge (Figure 3). This task is performed as follows:

- Assume a supine position with both lower extremities flexed so that the feet are on the mat and the ankles together (elastic band around knees).
- Lift the buttocks off the mat to a position of full hip extension.
- Abduct and externally rotate both lower extremities by separating the knees (concentric).
- Slowly return the lower extremities to the adducted position (eccentric).
- Slowly lower the trunk to the mat (eccentric).

The final challenge in the sequence is to incorporate a lateral plank prior to the performance of the clam shell (Figure 4). Thus, the exercise sequence for the clam shell plank would be as follows:

Figure 1. Clam shell supine.

Figure 2. Clam shell sidelying.

Figure 3. Clam shell bridge.

Figure 4. Clam shell plank.

- Assume a sidelying position with the lower extremities on top of one another.
- Hips should be in 0°-20° of flexion and the knees flexed to a position of comfort (elastic band around knees).
- With the inferior elbow under the shoulder, lift the inferior hip up off the mat into a lateral plank (trunk should

be in alignment with shoulders/feet and perpendicular to the mat).
- Abduct and externally rotate both lower extremities by separating the knees while the feet remain in contact.
- Slowly return the lower extremities to the adducted position (eccentric).
- Slowly lower the trunk to the mat (eccentric).

CLINICAL SIGNIFICANCE

The proposed therapeutic progression is based on the literature of Ekstrom et al.[6] The researchers analyzed the percent of maximal voluntary isometric contraction for 8 muscles during 9 different exercises. Table 1 summarizes the results for the supine bridge and lateral plank. Based on these results, 5 of the 6 muscles studied demonstrated greater activation with the lateral plank than the supine bridge. The one muscle that did not have greater activity was the gluteus maximus but the standard deviations were within comparable ranges. Thus, the lateral plank requires more muscle activity than the supine bridge.

One additional consideration in the performance of these exercises is the position of the hips prior to ER. The work of Delp et al[7] reported that the rotational moment arms of the hip muscles change with the amount of hip flexion. They studied the influence of 5 different angles of hip flexion (0°, 20°, 45°, 60°, 90°) on 18 muscle compartments of 8 muscles. For this study, a muscle compartment was analogous to the anatomic region of a muscle, ie, an anterior or posterior component of a muscle. They found that for many muscles of the hip, the internal rotation (IR) moment arms increased and the ER moment arms decreased as the hip was moved from full extension to 90° of flexion. More specifically, the gluteus medius transitioned from an ER to an IR between 20° and 45° of hip flexion. All compartments of the gluteus maximus were ER in extension. Whereas, the anterior compartments of the gluteus maximus switched to an IR moment with increasing flexion (transition occurred between 45° and 90°). Muscles that were identified as "dedicated" ER were the obturator internus, obturator externus, and quadratus femoris. These were muscles that maintained an ER moment throughout the hip range of motion. The clinical implications of this information is that exercises such as clam shells should be performed in hip extension (< 20° of hip flexion) to accentuate the ER moments. Finally, Baldon et al[8] identified the importance of eccentric hip abduction strength in clients with PFPS. Consequently, emphasis on the eccentric portion of the clam shell exercises are warranted to control the IR moments in functional activities.

Table 1. EMG Activity: Percent of Maximal Voluntary Isometric Contraction. Data from study by Ekstrom et al.[6] (mean ± SD)

	Lateral Plank	Supine Bridge
Gluteus Maximus	21 ± 16	25 ± 14
Gluteus Medius	74 ± 30	28 ± 17
Longissimus Thoracis	40 ± 16	39 ± 15
Lumbar Multifidus	44 ± 18	39 ± 15
External Oblique Abdominis	69 ± 26	22 ± 13
Rectus Abdominis	34 ± 13	13 ± 11

CONCLUSION

In conclusion, the goal of this manuscript was two-fold. First, to introduce a unique therapeutic progression to maximally challenge the muscles that externally rotate the hip. Second, provide evidence to emphasize hip position and how attention to the eccentric action of the exercise can enhance therapeutic effectiveness. By incorporating the additional exercises described here, the hip ER muscles can be maximally challenged to ultimately reduce knee valgus, improve patellar tracking, and decrease the risk of knee injury in patients with PFPS.

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Orthopaedic Section, APTA, Inc.

CSM 2012

Pre-conference Course Offerings

two day courses

Tuesday & Wednesday, February 7 – 8, 2012

A Practical and Informed Approach to Exercise Prescription for Neck Pain

Exercise for the patient with neck pain...how do you know which exercises would be most beneficial for your patient with neck pain? Is the exercise program effectively increasing your patient's regional endurance, strength and function? How many exercises should be prescribed? How can we improve exercise adherence? Join us for an opportunity to address these and other questions to enhance your skills in prescribing exercise for the management of chronic neck pain. This two-day course will detail the collaborative research findings from 1) the Centre of Clinical Research Excellence in Spinal Pain, Injury and Health and The Centre for Advanced Imaging; the University of Queensland, Australia and 2) the Department of Physical Therapy and Human Movement Sciences; Feinberg School of Medicine, Northwestern University, Chicago, IL, USA, and the new directions that are emanating from recent and ongoing research efforts. The course will feature details related to the examination, selection, administration and progression of specific exercises for patients with pain and physical impairments related to traumatic and non-traumatic neck pain. An evidenced-based approach will be used to demonstrate the scientific basis of clinical tests and non-invasive MRI measures used in a variety of research and clinical settings to measure pain and physical impairment in patients with neck disorders. Emphasis will be on differentiating the varied clinical presentation of patients with traumatic and non-traumatic neck pain. Furthermore, clinical decisions related to progression of exercise for the anterior and posterior neck muscles as well as the axioscapular musculature will be detailed.

Thrust Joint Manipulation Skills Development for Physical Therapists: A Laboratory Course

This course is designed to maximize physical therapists' ability to successfully modify manipulation techniques to produce the best results. These techniques will focus on operator stance, posture, handling, patient positioning, operator positioning and modifying factors. Treatment techniques use component techniques by applying multidirectional forces to apply a "focusing" technique rather than locking. This course will be primarily dedicated to hands on/lab practice. Guided discussions will provide for rationale, indications, contraindications of manipulation and risks.

one day courses

Wednesday, February 8, 2012

Manual Therapy Interventions for Individuals with Acute and Chronic Foot and Ankle Pathologies

This one-day hands on laboratory based course will focus on the use of mobilization and manipulation techniques that can be incorporated into the plan of care of individuals who have had extensive trauma to the foot and ankle as well as those individuals with chronic, overuse conditions. The morning session will initially focus on the current evidence to support the use of the manual therapy techniques to be presented, followed by hands on laboratory experiences. The afternoon sessions will focus on case studies to integrate the manual therapy concepts and techniques presented in the morning session. In addition, a discussion and practice session on the use of mobilization of movement will also occur in the afternoon session. Best available evidence will be integrated into all discussion and laboratory sessions. The intent of this course is to provide attendees with useful, clinically relevant information that can be immediately applied into various practice settings.

Sonography for Common Lower Extremity Orthopaedic & Sports Conditions

Sonography is fast becoming an adjunct to physical therapist management of orthopaedic and sports conditions from professional athletes and Olympians to outpatient clinics with a general orthopaedic patient population. This course will present the physical therapy application of musculoskeletal sonography for common hip, knee and ankle conditions. The course will provide an overview of the physics of sonography. Techniques of imaging the lower extremity will be presented. Identification of normal anatomy and abnormal morphology will be presented. The indications for, and limitations of, sonography and other imaging modalities in musculoskeletal conditions will be discussed. Participants will apply techniques learned using hands-on sessions with live demonstrations and practice sessions. The practical aspects of incorporating sonography into PT practice will be presented.

Evaluation, Conservative Intervention, and Post-Surgical Rehabilitation for Individuals with Non-Arthritic Hip Pain

Diagnosis and treatment of individuals with non-arthritic hip related pathology can be difficult secondary to the close interrelationship between the lumbopelvic complex, soft tissue structures, and the hip joint itself. This lab intensive course will outline an evaluation algorithm to assist with the differential diagnosis process for pathologies associated with the hip region. These specific evaluation techniques will allow for a classification-based treatment program and include hands-on mobilization techniques and innovative exercises. Essential diagnostic imaging techniques, including radiographs, magnetic resonance imaging arthrogram, and diagnostic injections, will be integrated into the evaluation process. Arthroscopic surgical procedures and techniques for post-surgical rehabilitation will also be discussed. This unique course will offer the teaching expertise of an orthopaedic surgeon who specializes in hip arthroscopy. Additionally, this hands-on course will allow clinicians to implement evaluation and treatment techniques into their practice. Concerns for the rehabilitation of athletes with sport-specific considerations will also be reviewed and include clinical pearls and perils to help improve patient outcomes.

2012 Combined Sections Meeting Programming
WE HEARD YOU!

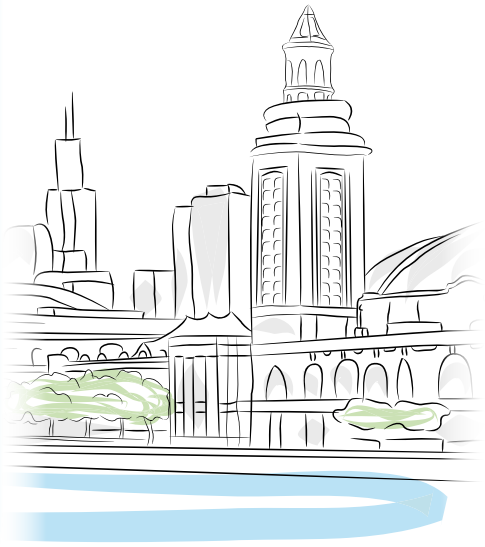
WE heard you…we listened, and CSM 2012 is going to be an entirely different experience!

What remains ***unchanged***: fantastic up to date programming, dynamic speakers and exceptional networking.

What ***has changed***:

- Each day looks the same - across all sections we will only have three educational sessions offered a day. Each session is 2 hours in length, and start at 8:00 AM, 10:30 AM and 3:30 PM.
- We will NOT have a combined-section program on Thursday morning, so all programming starts early on Thursday (you won't want to miss the classes offered at 8:00 AM, so plan on arriving Wednesday night).
- We are programming hot topics until 5:30 PM Saturday - so plan on staying Saturday night to take in a little of Chicago's nightlife!
- All Orthopaedic Section programming will be in consistent rooms all day.
- Only three Orthopaedic Section programs will be held at one time with as much diversity in selection as possible.
- Platforms will run in each time slot from 8:00 AM Thursday until 5:30 PM Saturday.
- The exhibit hall will be open each day from 1:00 PM - 3:00 PM, unopposed
- All evening programming will start at the same time: 6:30 PM!

Visit our web site for more information about this exciting upcoming conference: www.orthopt.org!



Book Reviews

Michael J. Wooden, PT, MS, OCS
Book Review Editor

Book reviews are coordinated in collaboration with Doody Enterprises, Inc.

Orthopaedic Practice (OP) is interested in having readers serve as book reviewers. Previous experience is recommended but not required. Timeliness in meeting publication deadlines is required. Invitation is only open to Orthopaedic Section members. Successful completion of each review results in the reviewer retaining a free copy of the textbook.

If you are interested, please contact Michael Wooden, Book Review Editor for OP at: michael.wooden@physiocorp.com

Clinical Orthopaedic Rehabilitation: An Evidence-Based Approach, 3rd Edition, Elsevier, 2011, $99
ISBN: 9780323055901, 586 pages, Hard Cover

Editors: Brotzman, S. Brent, MD; Manske, Robert C., DPT, MEd, MPT, SCS, ATC, CSCS

Description: This update of a book on the evaluation and treatment of the upper and lower extremities and the spine also includes access to additional content online. The previous edition was published in 2003. **Purpose:** The purpose is to provide evidence-based information on the evaluation and treatment of a variety of musculoskeletal disorders. This is an important update as the research continues to evolve and should be incorporated into practice. The authors meet their objectives, covering the latest research with a team of 89 contributors who are experts in their areas. **Audience:** The audience is physical therapists, orthopedic surgeons, family practitioners, athletic trainers, chiropractors, and others who treat patients with musculoskeletal disorders. This audience is appropriate, regardless of a practitioner's experience level. **Features:** The book covers the evaluation and treatment of injuries to the hand, wrist, elbow, shoulder, knee, foot, and ankle. Specific injuries and fractures have their own sections, which makes it easy to find information on a particular disorder. The arthritic lower extremity, spinal disorders, and special topics related to the lower extremities complete the book. Excellent anatomical illustrations and photographs demonstrate different fractures, anatomy, and exercises. The online resources include the full text as well as supplemental videos and links to PubMed abstracts. **Assessment:** This edition provides up-to-date information on orthopedic rehabilitation as well as helpful online resources organized in a way that allows for quick reference. This update is warranted by the wealth of research that has occurred since the 2003 edition.

Jeff Yaver, PT
Kaiser Permanente

Therapeutic Exercise: Moving Toward Function, 3rd Edition, Lippincott Williams & Wilkins, 2011, $72.95
ISBN: 9780781799577, 779 pages, Hard Cover

Editors: Brody, Lori Thein, PT, PhD, SCS, ATC; Hall, Carrie M., PT, MHS

Description: This comprehensive book is designed to assist clinicians with prescribing exercises to achieve the best outcomes and to foster effective clinical decision-making. **Purpose:** The purpose is to provide an outline or framework for learning how to make clinical decisions when selecting therapeutic exercises for a variety of diagnoses and impairments. Physical therapists and other clinicians must provide efficient and effective treatment plans to meet the functional goals expected by clients, the third party payors, and referring physicians. This book meets these objectives, providing a thorough outline to review and assist clinicians with decisions if they are unfamiliar with clinical patterns and outcomes. **Audience:** Although written for all professionals, the book is geared primarily towards students. It provides the background needed to assist with clinical decisions, but is not a manual of therapeutic techniques and activities. The basic intent of the book is to prescribe therapeutic exercises for clients with musculoskeletal dysfunctions and restore the maximal functional outcome possible. The authors are respected educators and they have recruited an extensive group of professionals to assist them with covering topics and providing critical reviews. **Features:** The book is divided into seven units that cover a foundation of therapeutic exercise, exercise for impairments of body functions, special physiologic considerations, specialties of exercise intervention, a functional approach to the lower and upper extremities, and case studies. Among the educational features in each chapter are illustrations and photographs of exercises, selected interventions written to develop exercise prescriptions, self-management tools, patient-related instructional information, key points, critical-thinking questions, and lab activities for the classroom. Several case studies help students develop the process of clinical decision making. Lastly, there is a "red flag" reference guide for identifying serious signs and symptoms that require urgent action. The book covers a great deal of information, which could make it appear not particularly user-friendly at first glance. However, the content is well organized and the book is a very thorough collection of information, with a helpful index. **Assessment:** This is an excellent reference on therapeutic exercise for students in training as well as experienced clinicians. The diagrams, photographs, and outlines of proposed protocols and techniques of treatment are very well done. Although it is difficult to learn manual techniques from a book, the presentation of material allows clinicians to improve their treatment plans with a variety of options to ensure good outcomes. Exposure to different treatment ideas will encourage continuing education to acquire the necessary skills. This book will be very useful for reviewing the anatomy, evaluation, and examination and development of treatment plans. I would recommend it as a reference for all clinicians.

Sylvia Ann Mehl, BS, MS
University of Southern California

Exercise for Special Populations, Lippincott Williams & Wilkins, 2011, $59.95
ISBN: 9780781797795, 440 pages, Soft Cover

Author: Williamson, Peggie, MS, CHES, CPT, CFT

Description: This book details precautions, recommendations, guidelines, and benefits of exercise for special needs clients commonly seen by health and fitness providers. **Purpose:** It is designed to assist health and fitness providers in developing safe and effective exercise programs as well as basic nutritional considerations for those with special needs. The book is a quick reference for those attending to the physical well-being of special needs populations. **Audience:** It is written for personal trainers, students enrolled in personal training programs, and students pursuing health and fitness professional degrees, but it is also appropriate for anyone in the fitness industry without a formal science background who may encounter clients with special needs. The author has an extensive background in health education, training, nutrition, and group fitness. **Features:** The book's three parts cover scientific foundations, exercise and nutrition from pregnancy to old age, and exercise and nutrition for disease and illness including obesity, cardiovascular disease, osteoporosis, arthritis, diabetes, cancer, asthma, and multiple sclerosis. Each chapter is intended to stand alone as a handy reference on a specific topic. Chapters are consistently formatted, beginning with anatomical and physiological changes associated with the condition, and moving through risk factors, precautions, recommendations, general guidelines, sample exercises, and nutritional considerations. Several features enhance learning -- definition boxes, quick references, highlights, and case studies. The sample exercises with pictures and descriptions are well done. Critical thinking questions conclude each chapter. Additional resources for students and instructors are available online. **Assessment:** This is an excellent resource for all health and fitness providers and students pursuing health and fitness professional degrees. It is clearly organized and provides practical information to safely guide a special needs client through an individualized exercise program. It is a bit basic for an experienced physical therapist, but a student or novice clinician would find it a valuable resource.

Lauren Yee Perrone, MPT, OCS
Head 2 Toe Physical Therapy

Exercise Therapy in the Management of Musculoskeletal Disorders, Wiley-Blackwell, 2011, $54.99
ISBN: 9781405169387, 264 pages, Soft Cover

Editors: Wilson, Fiona, BSc, MSc, MA, MISCP; Gormley, John, BSc; Hussey, Juliette, MA, MSc, PhD, Dip Phys

Description: This book thoroughly describes how various forms of exercise can be used to help patients manage musculoskeletal disorders and presents pertinent evidence to substantiate the application of exercise for various disorders. **Purpose:** The editors intend to provide an overview of the role of exercise therapy in the management of musculoskeletal disorders, evaluate the evidence for the use of exercise therapy as a treatment modality, provide practical ideas for the use of exercise therapy in the management of disorders in different areas of the body and for different pathologies, and promote the use of exercise among physiotherapists. This book meets these objectives clearly. As the application of exercise and patient self-management becomes a more crucial part of the rehabilitation process, it is important to have a reference like this that provides an evidence-based explanation of the appropriate use of exercise. **Audience:** It is aimed at undergraduate physiotherapy students, postgraduate physiotherapists, and other clinicians who design rehabilitation programs for their patients. It also benefits clinicians who have been designing exercise programs for some time to gather more evidence and new ideas for specific exercise regimes. The editors have selected a qualified group of contributors to assist them in this task. **Features:** The book initially reviews the principles of exercise in musculoskeletal disorders, before moving on to consider exercise for specific regions of the body. It covers the cervical, thoracic, and lumbar spine regions separately. Other chapters cover the shoulder, elbow and forearm, wrist and hand, hip and pelvis, knee, and ankle and foot. Separate chapters discuss exercise therapy in special populations -- the developing child, patients with cardiac and respiratory concerns, obese patients, and patients with osteoporosis. Unique features include case studies and student questions following the chapters on the specific regions of the body. The relative lack of figures is a shortcoming. More figures with graphics, such as arrows for manual stretches, also would have made the photos clearer and would have better supported the text descriptions. **Assessment:** Overall, this is a welcome addition. The book is not simply a compilation of exercises separated into body regions, rather it offers evidence-based rationales for their specific uses and, more importantly, when to progress a patient to higher levels of difficulty.

Jeff Yaver, PT
Kaiser Permanente

Finance Committee Report

Steven R. Clark, Chairman

The Finance Committee met in August to review financial operations and to make recommendations for the 2012 budget. The Gillette & Associates audit of the 2010 Section income/expenses has ascertained that Section operations and its cash flow is in conformity with accepted accounting principles through December 31, 2010.

AUDIT REPORT 2010
STATEMENT OF ACTIVITY
Years Ended December 31, 2010 and 2009

	2010	2009
UNRESTRICTED NET ASSETS		
Unrestricted Revenues, Gains, Losses		
Membership dues	716,330	702,462
Registration, meetings	653,126	578,839
Advertising income	40,407	43,922
Shipping and handling income	27,046	22,693
Publishing and administrative	34,766	55,192
Sale of promotional items	2,266	1,943
Miscellaneous	10,829	11,605
Investment income	67,240	48,989
Rental income	44,766	49,277
Sale of assets	239,850	(24,257)
Total Revenue	1,836,626	1,490,665.00
Less: Administrative Expenses	(263,929)	(273,308)
Program Expenses	(1,081,882)	(1,121,771)
Add: Unrealized Gain (loss) on Investments	177,676	314,621
Change in Unrestricted Net Assets	668,491	410,207
Net Assets at Beginning of Year	3,015,088	2,604,881
Net Assets at End of Year	$3,683,759	$3,015,088

MARKETABLE SECURITIES

	2009	2010
LPL Investment Reserve	$804,834	$980,830
LPL Building Fund	$0	$363,561
Wells Fargo Research, Practice, Education Fund	$959,339	$1,142,676

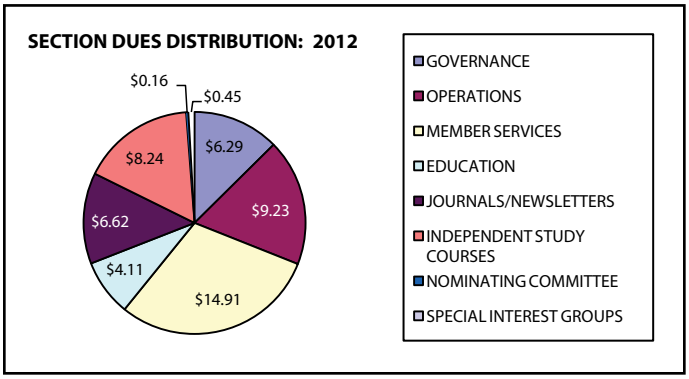
The 2010 audit demonstrates an increase in net assets from 2009 of $668,671. This increase demonstrates positive market returns for the LPL Reserve Fund, Wells Fargo Research, Practice and Education Fund, and the Building Fund which was initiated in 2010 upon sale of the adjoining land. Additionally, the Section has dedicated employees whom are committed to maximizing operational resources.

The following operating budget for fiscal year 2012 has been approved by the Section Board of Directors at the October meeting in Pittsburg.

2012 OPERATING BUDGET

	Income	Expense
Governance	$135,446	$216,285
Operations	$50,719	$317,047
Member Services	$731,500	$512,367
Education	$240,640	$141,337
Journals/Newsletters	$158,242	$227,567
Independent Study Courses	$401,631	$283,025
Nominating Committee	$0	$5,550
Occupational Health SIG		$2,500
Foot and Ankle SIG		$2,500
Pain Management SIG		$2,500
Performing Arts SIG		$2,500
Animal Rehabilitation SIG		$2,500
Imaging SIG		$2,500
TOTAL OPERATING	$1,718,178	$1,718,178

The 2012 budget will continue the Section's effort to progress the evidence-based practice of physical therapy including $50,000 for the Foundation for Physical Therapy and a $100,000 commitment for the development of the Section Research Network which is part of the strategic plan. Due to continued strong membership numbers and their willingness to participate in independent study courses our association dues will continue at the current levels (physical therapist $50.00) signifying no increase since 1994. At this time, the real estate market in LaCrosse does not support the Section moving forward with further rental property, thus a building of the footprint was not recommended.



If you have questions regarding the audit report for 2010 or the 2012 operating budget, feel free to contact me at Steven@clarkphysicaltherapy.com.

OCCUPATIONAL HEALTH

SPECIAL INTEREST GROUP

GREETINGS OHSIG MEMBERS!

Happy New Year! This is the first issue of 2012 and we are looking forward to Combined Sections in Chicago. It's not too late to register!

OHSIG PROGRAMMING AT CSM CHICAGO, IL

OHSIG programming takes place Thursday, February 9th from 8-11:30. The OHSIG Membership Business Meeting will immediately follow the programming from 11:30-12:30.

CSM 2012: PARTNERING WITH BUSINESS TO CREATE A HEALTHY, HIGH PERFORMING WORKFORCE

PART I: 8:00 AM – 10:00 AM

Changing the Conversation from Injury Management to Wellness Activities: Health Promotion in your Practice Setting and on the Job Site

****Break*: 10:00 AM – 10:30 AM

PART II: 10:30 AM – *11:30 AM

Changing the Conversation from Injury Management to Wellness

*OHSIG Membership Business Meeting: 11:30-12:30

Session Description

If you have ever wondered if there was a better approach to work injury prevention and management, don't miss this session! The Occupational Health Special Interest Group is excited to have a team of experts in Chicago for the Combined Sections Meeting. Dee W. Edington, PhD, Joanette Lima, CPE, and Cory Blickenstaff, PT, OCS, will lead the discussion. Key note speaker, Dee Edington has completed extensive research on health promotion within organizational environments and is the author of *Zero Trends*. Adding her experience in ergonomics, Joanette Lima, CPE, is the principal safety services manager for Disneyland. Cory Blickenstaff works with industry to directly provide services. They will combine their unique perspectives to present a thought provoking discussion on partnering with business to create a healthy, high performing workforce. Join your colleagues in this interactive session to "Change the Conversation from Injury Management to Wellness Activities, Health Promotion in Your Practice Setting and on the Job Site."

We hope to see you there!

NEW WORK REHABILITATION GUIDELINE POSTED

The Advanced Work Rehabilitation Guideline has been posted under the OHSIG on the Orthopaedic Section Web site. Log in, go to Occupational Health Guidelines, and you'll find Advanced Work Rehabilitation. We thank all those who worked on the guideline and hope you find this information helpful.

ANNOUNCEMENT OF OHSIG BULLETIN BOARD

If you missed it, the OHSIG now has an Electronic Bulletin Board on the Orthopaedic Web site. This is an active communication link for OHSIG members only! It's a great place to ask questions of your colleagues and share ideas. As of this writing, there have been 17 various topics discussed.

The link is https://www.orthopt.org/message_boards.php Login is required. This is a benefit of belonging to the OHSIG. We hope you will use it.

UPDATE: PETITION FOR SPECIALIZATION IN OCCUPATIONAL HEALTH PT

The ABPTS had questions related to our Petition for Specialization in OH. A face-to-face meeting was held mid-September to respond to questions. John Lowe, Dee Daley, Jill Galper, Lorena Pettit, and I met in Philadelphia. We continue to make revisions to the document and continue the path toward Specialization in OHPT.

OHSIG ACTIVITIES -- MEMBER PARTICIPATION

- APTA requested CMS to add a new Place of Service code for "work-site" to identify services that are delivered at the workplace when the practitioner does not maintain an office at that work-site. Karen Jost, Associate Director Payment Policy & Advocacy, APTA, informed the OHSIG that this request was being considered, and she requested additional information from OHSIG members. OHSIG members responded, providing her with the information she needed.
- OHSIG provided evidence for the efficacy of work hardening and work conditioning procedures with clinical examples for the Regulatory and Payment Counsel of APTA.
- OHSIG members participated in an International Multistakeholder Return-to-Work (RTW) Survey.
- OHSIG submitted feedback to the Massachusetts HCSB Chronic Pain Treatment Guideline draft.
- OHSIG was asked to review the Employment Services Standards related to CARF's Employment and Community Services customer service unit. They convened a series of International Standards Advisory Committees and focus groups to review and revise standards in the area of Employment Services. Anita Bemis-Dougherty, Associate Director, Department of Practice, APTA, asked for our review and comments to proposed standards.

As a reminder, be sure to watch for E-mail blasts from the OHSIG. If you do NOT receive E-mail blasts from us and you are an OHSIG member, please contact Tara Fredrickson at the Orthopaedic Section office tfred@orthopt.org (800-444-3982 x203) or inform any member of the OHSIG BOD. Announcements are usually time sensitive, so E-mail blasts are the best avenue of communication for us. Also, we will use the OHSIG Bulletin Board when we can.

NEED AUTHORS

If you are interested in submitting an article for *OPTP,* please let us know. We thank our contributing authors for this *OPTP* issue: Chris Juneau, PT, DPT, ATC, EMBA, and Student PTs, Eric Ingram and Brent Robinson. Their article, Holistic Emphasis, recognizes the founders and mentors of physical therapy, today's physical therapy leaders, and the latest functional movement assessment screens.

MEMBER INVOLVEMENT

If you have suggestions, questions, or comments contact any of the BOD members. We'd love to hear from you! You can find the officer listing on the Orthopaedic Section Web site, under Special Interest Groups.

Professional Regards,
Margot Miller, PT
OHSIG President

HOLISTIC EMPHASIS

Chris Juneau, PT, DPT, ATC, EMBA
Center Therapy Director
Concentra Urgent Care
Jefferson, LA

Eric Ingram, SPT, & Brent Robertson, SPT
Louisiana State University Health Science Center
Department of Physical Therapy
New Orleans, LA

INTRODUCTION

As clinicians and physical therapists, we play a pivotal role in improving or restoring patient quality of life and return to work status. An industrial sports medicine philosophy emphasizes how critical it is to recognize the source of dysfunction, as opposed to focusing primarily on pain. Pain is a subjective opinion, a personal experience or a personal perception, not an objective finding. As clinicians, if we can essentially recognize and address the source of the pain, in most cases, the pain and dysfunction can be treated and resolved.

It is with the vision and insight of our mentors and influential pioneers of physical therapy that we lay our therapeutic foundation. Mentors such as Mary McMillan,[1] Vladimir Janda, Florence Kendall, Stanley Paris, Shirley Sahrmann, and Gary Zigenfus have defined and established our therapeutic philosophy as clinicians. Current clinicians such as Gray Cook, Sue Falsone, and Kevin Wilk are refining and redefining our therapeutic and holistic approaches.

The purpose of this article is support the benefits of a holistic rehabilitation approach which skillfully identifies and emphasizes the whole individual. Physical therapists should implement a more individualized, holistic, and functional therapeutic exercise program designed specifically to the respective patient's deficits and dysfunctions. Dorland's Medical Dictionary defines *holistic* as pertaining to totality, or to the whole. Holistic health includes the physical, mental, social, and spiritual aspect of a person's life as an integrated whole.[2]

In 2008, Dr. Stanley Paris stated in a presentation during a Manual Therapy Certification Review in St. Augustine, Florida, that we, as physical therapists, are no longer treating medical diagnoses, but rather we are treating the whole individual. More specifically, we are treating the dysfunctions and impairments; however, they are related to the patient's respective issues or for the purposes of injury prevention.[3] It has also been said that posture is one's outlook on life. In the Occupational Health sector of physical therapy, there is much validity to this statement. In Physical Therapy school, we are taught to identify a patient's deficits and create a problem list. As a practicing physical therapist, we may identify a number of deficiencies ranging from mobility, strength, balance, postural asymmetries, and functional deficits. Reflected by their posture, the patient may only identify one problem--pain!

Ironically, what is the common complaint among patients, athletes, and/or clients medically diagnosed with lower back pain? Pain! Biomechanically, the spine is a postural chain and changes in one region will affect another. Muscle tightness or weakness to any muscles attaching to theses structures may cause altered postural position. Position of these structures is a key component concerning the assessment of posture and when looking for the source of low back pain.

One potential cause of pain is musculoskeletal imbalance. Unfortunately, many clinicians may falsely prioritize pain and treat this symptom with modalities rather than further identify the source or underlying cause. There are two primary schools of thought regarding muscle imbalance: a structural approach and a functional approach.

Vladimir Janda defined functional pathology as "an impairment in the ability of a structure or physiological system to perform its job; this impairment often manifests in the body through reflexive changes." This concept requires a vast understanding of complex interactions of systems and structure. In reference to

Figure 1. Poor sitting posture.

Figure 2. Proper sitting posture.

Janda's approach, he defines muscle balance as "relative equality of muscle length or strength between an agonist and an antagonist."[4]

Can a muscle imbalance cause pain? The Biological Paradigm attempts to explain muscle imbalances resulting from prolonged postures and repetitive movements. Janda is considered the father of the neurological paradigm. In a time of dysfunction, the neural control units alter muscle recruitment strategies in order to stabilize a joint temporarily. This temporary change could alter a motor program and become more permanent.[4] "The science and practice of movement screening and assessment is an organized system for discussing and documenting movement patterns."[5]

Examples of Movement Screens include: The Functional Movement Screen (FMS) and Selective Functional Movement Assessment (SFMA) developed by Gray Cook, and Janda's Basic Movement Patterns. The FMS is a tool for risk assessment and management. The examiner is required to identify areas of movement-pattern limitation, asymmetry, and imbalance. The FMS attempts to detect dysfunctional movement patterns that can potentially present as contributors to future disorders. The FMS is a 7-step screening system with 3 clearing tests, designed to rank movement patterns basic to normal function of active people. The 7 components include the deep squat, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability pushup, and rotary stability.[5]

The Selective Functional Movement Assessment (SFMA) is a movement-based diagnostic system consisting of 7 key full-body movement tests. It is designed to assess fundamental movement patterns in those with known musculoskeletal pain. The goal of the SFMA is to capture the patterns of posture and function, comparing these patterns to a baseline. Respectively, the SFMA is an assessment tool used to "gauge the status of movement-pattern-related pain and dysfunction."[5] This tool uses movement to provoke symptoms and demonstrate limitations and dysfunctions. The SFMA top-tier tests consist of Cervical Spine Patterns, Upper Extremity Patterns, Multisegmental Flexion, Multisegmental Extension, Multisegmental Rotation, Single Lower Extremity Stance, and Overhead Deep Squatting.

Vladimir Janda identified 6 basic indicators for movement patterns that provide overall information about a particular patient's movement quality and control. Janda's basic movement patterns include hip extension, hip abduction, trunk curl-up, cervical flexion, push-up, and shoulder abduction. When performing the evaluation, the therapist should pay particular attention not only to the firing order of muscle activation but also to compensatory movement patterns.[4]

For a quick reference, recommended uses of the Functional Movement Screen, Janda's Screen, and the Selective Functional Movement Assessment are listed below. The FMS essentially targets qualified health care providers that work with (holistic) movement as it relates to exercise, recreation, fitness, and athletics. The FMS can also be applied to military personnel, the labor work force, fire fighters, and other highly active occupations. The FMS is not intended for those displaying pain in the basic movement patterns. Those individuals displaying pain can be better assessed using the SFMA.[5] Prior to the development of the FMS and SFMA, Janda identified 6 basic movement patterns that provide a fundamental and essential assessment of the individual's movement quality and control. Janda's screen and respective approach is to increase endurance in repetitive coordinated movement patterns. Since fatigue is a predisposing factor to compensated movement patterns, endurance is more important than absolute strength.[6]

1. Functional Movement Screen
    a. Athletic Screens
    b. Pre-employment Screens
    c. Fitness and Wellness Screens
2. Selective Functional Movement Assessment
    a. Clinical Screenings
    b. Initial Evaluations
    c. Differential Diagnosis
3. Janda's Screen
    a. Clinical Screenings
    b. Initial Evaluations

An important question to consider during a patient's therapy session is the following: "Is the location of pain simply a compensation for mobility or stability, and are there stability/mobility issues elsewhere?" Even great athletes can be great compensators. Find and treat the source of pain, as well as the site. By assessing and observing respective movement patterns, the clinician will get an impression of how structural relationships are created and what we can do to restore function.[7] The power of observation during examination is critical to this process.

Greater understanding of dysfunction using the holistic approach will lead to a more comprehensive exam process and more efficient treatment programs. Skilled physical therapy intervention requires that a therapist be able to identify and treat the respective patient in a holistic manner by assessing the whole individual, including issues that involve dysfunctional impairments such as strength, functional mobility, balance, and asymmetries.

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PERFORMING ARTS

SPECIAL INTEREST GROUP

PRESIDENT'S MESSAGE

The PASIG has been busy getting our resource page on the Orthopaedic Section Web site up and running. Thanks to Leigh Roberts, PT, DPT, Past President of the PASIG, who has been instrumental in bringing it to life. Please check it out at *www.orthopt.org* as it is a great resource to find information about topics in the performing arts and is free to members. Also, use our clinician finder to locate a performing arts clinician in your area. If you are not listed in the clinician finder, please fill out the membership profile so you can be added to our database.

The PASIG is excited about our programming for CSM 2012 in Chicago. The programming will take place on Friday, February 10th from 8:00 am to 12:30 pm. Our PASIG business meeting will be held as a part of our programming. I encourage all you to attend. Our program topic this year is *"The Core of the Matter: from the Hips to the Lips"* with Mary Massery, PT, DPT, as our keynote speaker and case studies presented by Jeff Stenback, PT, DPT, and Amy Humphrey, PT, DPT.

The elections for the nominating committee member for the PASIG took place in November. We thank the 3 candidates, Rosie Canizares, PT, DPT; Danelle Dickson, PT, DPT; and Melissa Strzelinski, PT, MPT, for their participation in the election. We will announce the election results at the business meeting in February.

I would like to take this opportunity to thank Shaw Bronner, PT, PhD, OCS, for her years of service as the Research Chair of the PASIG. She will surely be missed. She will be stepping down at CSM 2012. I am pleased to announce our new Research Committee Chair, Annette Karim, PT, DPT, OCS, will be transitioning into this position for CSM 2012. If you have any ideas that are research-related new projects or content for the PASIG Research Committee, please reach out to Shaw at sbronner@liu.edu.

Sincerely,
Julie O'Connell, PT, ATC
PASIG President

PERFORMING ARTS CONTINUING EDUCATION

Performing Arts
Independent Study Courses

Orthopaedic Section Independent Study Course.
20.3 Physical Therapy for the Performing Artist
Monographs are available for:

- Figure Skating (J. Flug, J. Schneider, E. Greenberg)
- Artistic Gymnastics (A. Hunter-Giordano, Pongetti-Angeletti, S. Voelker, TJ Manal)
- Instrumentalist Musicians (J. Dommerholt, B. Collier)

Orthopaedic Section Independent Study Course.
Dance Medicine: Strategies for the Prevention and Care of Injuries to Dancers
This is a 6-monograph course and includes many PASIG members as authors.

- Epidemiology of Dance Injuries: Biopsychosocial Considerations in the Management of Dancer Health (MJ Liederbach)
- Nutrition, Hydration, Metabolism, and Thinness (B Glace)
- The Dancer's Hip: Anatomic, Biomechanical, and Rehabilitation Considerations (G. Grossman)
- Common Knee Injuries in Dance (MJ Liederbach)
- Foot and Ankle Injuries in the Dancer: Examination and Treatment Strategies (M. Molnar, R. Bernstein, M. Hartog, L. Henry, M. Rodriguez, J. Smith, A. Zujko)
- Developing Expert Physical Therapy Practice in Dance Medicine – (J. Gamboa, S. Bronner, TJ Manal)

Contact the Orthopaedic Section at: www.orthopt.org
Or call 1-800-444-3982

Join us in Chicago in February for CSM!

PASIG Programming:
Friday, February 10, 2012
8:00-11:30 *"The Core of the Matter: From Lips to Hips"*

Mary Massery, PT, DPT, will provide our keynote with focus on a multi-systems approach that includes how interactions between breathing, talking, and postural stability affect movement with application to the performing artist. Jeff Stenbeck, PT, DPT and Amy Humphrey, PT, DPT will follow the keynote with case presentations of an instrumental musician and a dancer integrating these multi-systems principles into management of these performing artists.

11:30 – 12:30 Performing Arts SIG Business Meeting

Join us after the programming for our annual business meeting. Student Awards will be given as well as discussion of other PASIG activities for the past and upcoming year.

FOOT & ANKLE

SPECIAL INTEREST GROUP

PRESIDENT'S MESSAGE

What is the best part of the winter season? CSM of course! The FASIG is again presenting great programming, so don't miss it!

Thursday, February 9

Ankle Instability: Current Concepts for Evaluation and Management, Part 1

Time: 8:00 am-10:00 am
Speakers: Todd E. Davenport, PT, DPT, OCS
John Meyer, PT, DPT, OCS, FAFS
Terry Grindstaff, PT, PhD, SCS, CSCS, ATC

Ankle instability is one of the most common foot and ankle conditions managed by physical therapists. Sponsored by the Orthopaedic Section Foot & Ankle Special Interest Group, Part 1 of this 2-part session will provide attendees with the optimal evaluation and treatment strategies for the management of individuals with ankle instability. The current best practice model as outlined in the Ankle Instability Clinical Guidelines currently being developed by the Orthopaedic Section's ICF Foot & Ankle Workgroup will provide the framework for this presentation. The speakers will highlight current controversies in practice and research. During the second hour of programming, the speakers will address the examination and management of syndesmotic or "high" ankle sprains, considered to be one of the most complex types of ankle sprains. The anatomy of the distal tibiofibular syndesmosis, mechanisms of injury, evaluation, differential diagnosis, appropriate imaging, rehabilitation, and return-to-activity guidelines will be presented based on current, best available evidence. The format for this session will include lecture and interactive discussions between presenters and attendees.

Upon completion of this course, you'll be able to:

- Describe evidence-based practice, including diagnosis, prognosis, intervention, and assessment of outcome, for individuals with ankle instability.
- Integrate anatomical, biomechanical, and neuromuscular concepts relating to the etiology, examination, and intervention strategies for individuals with ankle instability that are commonly employed by physical therapists but require further research to advocate their use.
- Formulate an evaluation and rehabilitation program for individuals with syndesmotic or high ankle sprains that include return-to-activity guidelines.
- Apply the International Classification of Functioning, Disability, and Health terminology related to impairments of body function and body structure, activity limitations, and participation restrictions for individuals with ankle instability.

Ankle Instability: Current Concepts for Evaluation and Management, Part 2, & Foot & Ankle SIG Business Meeting

Time: 10:30 am-12:30 pm
Speakers: Todd E. Davenport, PT, DPT, OCS
John Meyer, PT, DPT, OCS, FAFS
Terry L. Grindstaff, PT, PhD, SCS, ATC

The first hour of programming in this second of two sessions will include a panel discussion of case studies involving an individual with ankle instability and an athlete with a syndesmotic ankle sprain, followed by a question-and-answer session. The format for this one-hour course will be lecture, as well as interactive discussion between presenters and course participants. During the second hour of this session, the Foot & Ankle Special Interest Group will conduct the group's annual business meeting.

Please take a moment, right now, and mark your schedule for our annual business meeting. Yes it does mean an early rise on Friday morning, but you are needed. We have so much to do! The coffee will be ready.

The FASIG is beginning an exciting project designed to enhance the way entry-level physical therapists learn about the foot and ankle. When it comes to the foot and ankle, what was your PT school education like? Looking back, what might you have done differently? Our meeting will convey information about how future physical therapists can learn orthopaedic foot and ankle information. So don't miss this awesome opportunity to make a difference!

Over the past few years, the FASIG has generated funds through its own programming. I want you to know that the FASIG has contributed over $30,000 to fund research dedicated to foot and ankle areas of study. This money is now bearing fruit with genuine research data. Please come and experience the FASIG at work.

See you in Chicago!

Clarke D. Brown, PT, DPT, OCS, ATC
FASIG President

FASIG WELCOMES CHRIS NEVILLE, PHD, PT, AS RESEARCH CHAIR

Chris Neville, Assistant Professor at the College of Health Professions at Upstate Medical University in Syracuse, New York, has accepted the FASIG's Research Chair position. Chris is already an accomplished researcher and brings his expertise to the FASIG.

CASE STUDY: SOCCER PLAYER WITH ANKLE SPRAIN THE USE OF SOCIAL MEDIA TO SUPPLEMENT PHYSICAL THERAPY INTERVENTION

Matthew S. Kearns, PT, DPT

Background

History: The patient is a 14-year-old female soccer player with complaints of left ankle pain with initial onset on 9/16/10. Mechanism of injury is described as an inversion motion stress experienced when stepping in a hole on the field during a soccer game. Patient was initially seen by an orthopaedic MD and was diagnosed with a left ankle sprain. The physician prescribed a walking boot for 4 weeks at initial visit. Following 4 weeks in the walking boot, the patient returned to the physician with continued complaints of lateral ankle pain. At a follow up appointment, the physician ordered radiographs of the left ankle that revealed no bony pathology. The physician then prescribed 4 more weeks of the walking boot, prescription of Meloxicam (Mobic) for pain control, and a referral to physical therapy. On 11/4/10, the patient presented to the physical therapy office in her walking boot for initial evaluation with continued complaints of lateral ankle pain that was exacerbated during walking.

Examination

Observation: Observation of the patient in standing reveals bilateral pes planus feet with a lack of longitudinal and transverse arch support.

ROM: AROM presented with the following deficits dorsiflexion 0-1°, plantar flexion 0-40°, inversion 0-18° accompanied by pain, and eversion 0- 10°. Supination and pronation were limited and accompanied by pain localized to the cuboid.

Muscle Strength Assessment: MMT was performed and revealed a 4/5 muscle grade for the anterior tibialis, gastrocnemius, posterior tibialis, and peroneals. Foot intrinsic musculature also presented with 4/5 muscle grade with MMT.

Balance/Proprioception: Marked deficits in proprioception/balance were noted with inability to maintain single leg stance greater than 30 seconds without UE support. Balance testing in single leg stance was accompanied by mild pain.

Gait: Gait was marked by an antalgic limp on the left involved lower extremity through all phases of stance with greatest pain occurring at push off.

Special Tests: Anterior drawer test was negative for laxity and pain. Talar tilt test was negative for laxity and pain.

Joint Integrity: Joint play at the calcaneocuboid joint revealed hypomoblity as well as some pain. Hypomobility of talocrural and subtalar joint was also noted.

Palpation: Palpation to the cuboid produced pain and revealed a subluxed cuboid. Palpation to the calcaneocuboid ligament produced tenderness as well.

Imaging: The patient brought a copy of the her radiographs to physical therapy evaluation and the position of the cuboid was noted on the radiograph.

Evaluation/Diagnosis/Prognosis: hypomobile cuboid with calcaneocuboid ligament sprain. Deficits in ROM, strength, proprioception/balance, and function likely attributable to the use of the walking boot (6 weeks duration at time of initial physical therapy evaluation). Patient was deemed to have a good prognosis with physical therapy.

Intervention: The physical therapist determined the patient was a candidate for a cuboid whip to correct for a hypomobile cuboid. The physical therapist understood the theory and principle behind and had observed performance of the cuboid whip technique. However, the therapist never received formal instruction in the performance of this technique. The therapist sought instruction of proper performance of a cuboid whip through a search of the internet. The therapist searched for cuboid whip on YouTube and found several instructional videos detailing the proper performance of a cuboid whip. The therapist watched videos which they believed originated from two credible sources on YouTube. Following study of the videos, the therapist felt comfortable in performing the cuboid whip technique. The therapist selected the cuboid whip technique that positions the patient in prone and takes the patient from a position of knee flexion and dorsiflexion to knee extension and plantarflexion with palpation and pressure applied to the cuboid. High velocity low amplitude force was then imparted into knee extension and plantarflexion. Following performance of the cuboid whip, the patient was instructed to ambulate and for the first time since initial injury the patient stated she was able to ambulate without pain. After consultation with the referring physician, the patient's walking boot was discontinued. The physical therapist then implemented a lower extremity stretching program with inclusion of stretches for gastrocnemius and soleus musculature and prescribed a PRE program with Thera-Band for PF, DF, INV, and EV to be performed by the patient at home. The patient's physical therapy program was then progressed to include proprioceptive/balance training for the lower extremity and weight bearing PREs for the lower extremity, specifically the gastrocnemius soleus complex. The patient returned to therapy on her third visit with complaints of return of lateral foot pain following swimming and pushing off from the wall with her left foot. Re-evaluation was performed and the cuboid whip technique was again performed and again alleviated the patient's pain. The patient was then instructed to avoid strenuous exercise (running, jumping, swimming, etc.) until she received clearance from the physical therapist. After her third visit, the patient was seen twice a week for an additional week and then frequency of visits was decreased to once a week for 3 weeks for a total of 8 visits. Following her third visit to physical therapy, no return of foot pain or lateral ankle discomfort was noted. The physical therapist then designed a program that focused on a progression from NWB to WB PREs for the LE with focus to musculature articulating to the cuboid to assist in stabilization, proprioceptive/balance training, LE flexibility program, and eventual progression to plyometrics/running/agility grid training/ sports specific activities.

Outcome: The patient returned to playing soccer without any return of previous symptoms and with no restrictions. MMT grades now rate a 5/5 throughout the ankle musculature and foot intrinsics. The patient was able to balance for 30 seconds in single leg stance on a round bottom balance board.

Conclusion: The use of mentoring in physical therapy is a well-known strategy for learning in a clinical setting. The *opportunity* for mentoring, in this case, was borne out of the use of the internet to seek out further knowledge and instruction in care and treatment of this patient in conjunction with standardized physical therapy procedures.

PAIN MANAGEMENT

SPECIAL INTEREST GROUP

PRESIDENT'S MESSAGE

John E. Garzione, PT, DPT, DAAPM

Hope you all had a joyous holiday season with family and friends. Happy New Year. This year, CSM in Chicago promises to be another great time to recharge, renew, and learn. The Pain Management SIG programming, combined with the Women's Health Section, will be on Friday February 10, 2012 from 8 am until 12 pm with a 30-minute break. Watch for upcoming details with regard to the business meeting time.

This year's CSM program will be "Chronic Pain: Myths, Measures, and Management" presented by D. Dailey and K. Sluka from the University of Iowa. This presentation is designed to provide clinicians with the information needed for the evaluation and treatment of patients with chronic pain.

Chronic pain is a challenging diagnosis for the clinician and presents significant disability for the patient. To better understand how to evaluate chronic pain, the underlying mechanisms of chronic pain based on the current science will be presented. The latest research will be discussed in terms of translating science and research into clinical practice. Chronic pain diagnoses such as low back pain and fibromyalgia will be reviewed and the biopsychosocial model of pain will be used to develop an individual plan of care and self management strategy for patients with chronic pain. Evidence-based tests and normative data will be presented in order to establish an objective baseline and ongoing assessment. Treatment topics and progression of treatment will be reviewed with an emphasis on self management skills for daily care, exacerbation of symptoms, and evidence-based treatment. Case study presentations will be used to demonstrate patient evaluation, treatment, and management strategies. The course objectives indicate that the learner will be able to: describe the myths regarding chronic pain and the science of pain as it relates to chronic pain, describe the biopsychosocial model of pain as is relates to determine the evaluation needs for patients with chronic pain, describe the evidence-based tests and measures related to chronic pain evaluation and treatment, and describe the areas for teaching self-management skills for patients with chronic pain.

A special thanks once again goes to Beth Jones and her team for putting together this exciting programming.

All articles pertaining to the management of people in pain are welcome to submit for consideration and publication in OPTP. Case studies, new ideas for treatment, are just a few examples. Please submit your ideas to me at any time.

Happy New Year and I hope to see many of you at CSM,
John

IMAGING

SPECIAL INTEREST GROUP

The latest reader's survey for the *Journal of Orthopaedic & Sports Physical Therapy* (*JOSPT*) states that the new Musculoskeletal Imaging section is one of the reader's favorite new additions to *JOSPT*. The one-page case overview with images seems to be a huge hit with members of the Orthopaedic Section. The question is how do you use this new feature? As expected, some members like to read and learn from this new feature, while other readers are using it for lunchtime discussions with fellow clinicians or during journal clubs. Faculty members are using the PowerPoint slides that are provided on-line to augment their teaching. Students enjoy reviewing the cases as they prepare for their examinations. So, how are you using this new feature?

WE ARE GROWING! JOIN US!

The NEW Orthopaedic Section's Imaging Special Interest Group (ISIG) is growing! We are excited that so many individuals have joined our new SIG in such a short period of time. Please join the Imaging SIG by sending an E-mail to Tara Fredrickson at tfred@orthopt.org.

You may ask – why join the Imaging SIG prior to CSM? Imaging is integral to the field of orthopaedic physical therapy whether you are a clinician, educator, policy maker, or researcher. Additionally, physical therapists that successfully incorporate imaging into their practice will be better positioned in the integrated health care delivery system. Imaging is poised to help take the practice of physical therapy to a higher level. **The goal of your Imaging Special Interest Group will be to help provide support, education, and resources to help physical therapists optimally integrate imaging into their practice, foster research using imaging, and promote imaging education**.

To that end – we are hoping you will join the imaging SIG and then join us for our first business meeting at CSM where we will help set the mission, vision, and priorities for the imaging SIG so that this new group can help meet the needs of the physical therapist within the Orthopaedic Section.

Imaging Special Interest Group Officers

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Douglas M. White, DPT, OCS

Vice President
Deydre Teyhen, PT, PhD

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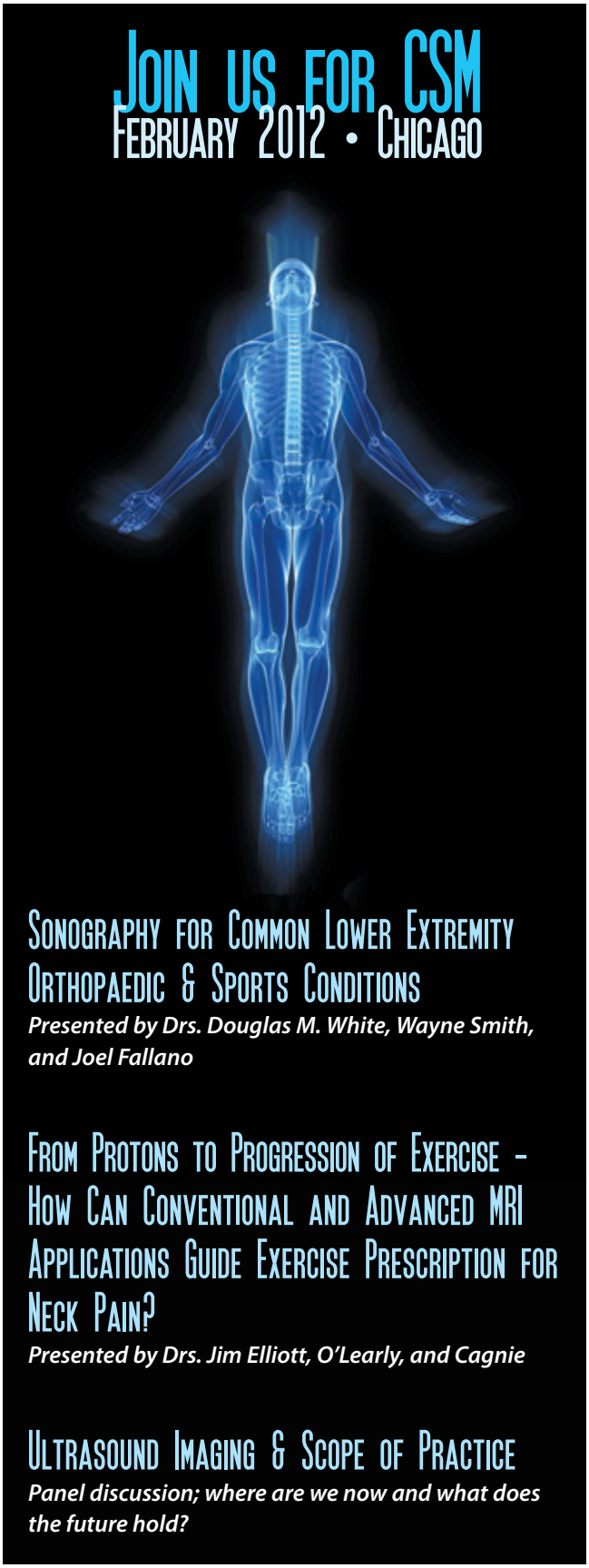

ANIMAL REHABILITATION

SPECIAL INTEREST GROUP

MARK YOUR CALENDARS!

CSM 2012 is coming soon! It is being held in Chicago, IL, February 8-11. Narelle Stubbs, PT, PhD, BApp, ScPT, MAnSt, will be presenting **"Equine Physiotherapy Research Update, Clinical, Pathological, Imaging and Exercise-based Rehabilitation Studies"** on Saturday, February 11, from 8-12, with the ARSIG business meeting immediately following.

The ARSIG held its semi-annual conference call on October 17th. The topics discussed included the practice analysis, the legislative survey, programming for the combined sections meeting and the independent study course. The practice analysis work is ongoing; one of the issues is the length of time that has passed since some of the information was obtained from members. It was discussed that perhaps a new practice analysis be given so the information is accurate, as our practice has grown and evolved a lot in the past several years. The plan is to have a "rough draft" of the analysis done around the time of CSM, so that it may be discussed during the business meeting. The results of the legislative survey are in, and a statistical analysis of the date has begun. The SIG plans to use the results of the survey to assist them in writing a position statement. The Orthopaedic Section has approved the SIG to produce an independent study course to be used for CE credits. It will be a 3-monograph course, including "Evaluation of the Canine Patient" written by Lisa Bedenbaugh, PT, CCRP, and Evelyn Orenbuch, DVM, CAVCA, CCRT, CVA (pending); "Evaluation of the Equine Patient" written by Narelle Stubbs, PT, PhD, BApp, ScPT, MAnSt, and Melissa King, DVM, PhD (candidate); and "Zoonoses/Red Flags" written by Mike Lappin, DVM, PhD. The course will be published in 2013.

Charles Evans, MPT, CCRP, has graciously submitted information on Degenerative Myelopathy to share with ARSIG members. This handout is suitable for teaching owners more about the disease and management strategies.

DEGENERATIVE MYELOPATHY

With a disease like Degenerative Myelopathy, which has no cure, one of the most important coping mechanisms is information. It was with this in mind that this document was created. There are many decisions that have to be made at each stage involving not only your dog's quality of life but the owner/caregiver's quality of life. At the end of each stage presented below, we will list the problems to be confronted and, if available, the means and/or decisions to be made to deal with these problems.

Canine degenerative myelopathy (DM) is a progressive disease of the spinal cord and ultimately the brain stem and cranial nerves which, at its end stages, results in complete paralysis and death. The closest human equivalent may be Amyotrophic Lateral Sclerosis, or ALS, also known as Lou Gehrig's disease. The same gene mutation is implicated in both diseases.

Degenerative myelopathy was first described as a specific neurological disease in 1973. The cause of the disease is not known although recent research has found a possible genetic link. The mutated gene has been found in 100 breeds including Cardigan and Pembroke Welsh Corgis, Chesapeake Bay Retrievers, Irish Setters, Boxers, Collies, German Shepard Dogs, and Rhodesian Ridgebacks. In a recent study, 2% of German Shepard dogs were identified as having the disease. Only 0.19% of dogs in general have the condition.

The disease typically appears between 5 and 14 years of age depending on the breed of dog. Both sexes appear to be equally affected.

What is Actually Happening?

Degenerative myelopathy begins in the spinal cord in the thoracic or chest region. The white matter of the spinal cord, which contains the nerve fibers responsible for transmitting movement commands from the brain to the limbs and sensory information from the limbs to the brain, degenerates. One theory for the cause of DM is that the immune system itself attacks the nervous system causing the degeneration. The degeneration consists of demyelinization of the nerves and actual loss of nerve fibers. If you think of the nerve fibers as an electric wire, the myelin (a white fatty material that surrounds the nerve fibers) would be the insulating coating on the outside of the wire. Without this coating, nerve impulses cannot be transmitted.

According to Dr. Joan R. Coates (www.vmth.missouri.edu/coates_joan.htm), one of the leading experts in this condition, DM is not an inflammatory disease. She states that DM is similar to oxidative stress that characteristically has a release of free radicals resulting in cell degeneration.

Symptoms/Warning Signs

Degenerative myelopathy has a slow, insidious onset with a slow progression of weakness. It is not uncommon for the signs to progress slowly, then plateau, and then start to progress again. These symptoms often begin in one rear leg and then eventually involve both rear legs as the disease progresses or it might affect both rear legs at the same time. This condition is NOT painful. As a result, with appropriate physical therapy and nursing care, patients with DM can still have a good quality of life for a significant length of time.

Early signs (3-6 months)

Degenerative myelopathy initially affects the rear limbs. At first you may notice rear limb weakness and muscle loss, decreased coordination, loss of balance, difficulty with transferring from lying down or sitting to standing, and/or inability to climb stairs or jump into the car or onto furniture. These symptoms are also typical of other conditions, such as arthritis and hip dysplasia and other spinal diseases (eg, disk protrusion/herniation). If you are seeing these signs you should contact your veterinarian and have your dog examined.

Problems:

- Loss of balance

- Assistance needed for transferring
- Damage to the feet and nails of the hindlimb

Helpful Tools:

- There are a number of harnesses and/or slings made for supporting the hindquarters. These will enable you to assist your dog in transferring from lying down or sitting to standing and they will allow you to help with balance/stumbling or weakness on walks. The harness may also help to prevent damage occurring to the feet from scuffing.
- Booties – There are a number of foot protection boots in the marketplace. We can help you with recommendations tailored to your dog's needs.
- Physical therapy – Exercise modification can be important at this stage to prolong your dog's function. Shortening the walks but taking more walks daily is one solution. Swimming or walking in the water is also very effective in maintaining muscle mass. Check with a physical therapist that is certified in canine rehabilitation for further information on home programs.

Note: The solutions to the problems at this stage are fairly inexpensive and not too time consuming. But the walks with your dog will be much more intense experiences since you will be counted on to help provide some mobility. You should check your dog's feet daily for damage to the skin or nails.

Note: Degenerative Myelopathy has a slow onset and is NOT painful. If these early symptoms occur suddenly or if your dog is in pain, you are most likely not dealing exclusively with DM. Make sure that your veterinarian, or a veterinary neurologist, examines your dog for other conditions that may involve the spine. **DM does not come on suddenly.** Other disorders such as disk disease, disk herniation, spinal cord tumors, and FCE (a "stroke" in the spinal cord) can also cause symptoms similar to DM, but with a much more rapid onset.

Next phase (3-6 months)

The next stage of symptoms are knuckling or walking on the tops of their feet (loss of conscious proprioception), limp tail, crossing of the hindlimbs under the body (scissoring), or a rear leg drag. Check the two middle toes of the feet to see if there is unusual toe nail wear. The middle two toes are the main weight bearing digits of the foot.

As the symptoms progress, you will begin to see worsening signs of weakness and dragging the hindlimbs on the ground or floor. Urinary and/or fecal incontinence occur very late in the course of the disease. You may also note a hoarseness or loss of volume to the bark.

Problems:

- Increasing difficulty with walking
- More extensive damage to the feet
- Loss of mobility
- Incontinence
- Quality of life issues

Helpful Tools:

- A combination front and rear harness will help as the paralysis increases.
- A wheelchair or cart will significantly improve a dog's mobility and quality of life.
- Aquatic therapy is very effective at this stage for maintaining forelimb muscle mass and quality of life.
- You will have to learn how to either express your dog's bladder or catheterize the bladder daily.
- You will have to check your dog and his bed daily to avoid urine scalding since they may not be able to avoid voiding on themselves or their bed.
- This would be the first stage at which, because of quality of life issues (for both you the owner and the dog), euthanasia might be considered.

End stage (3-6 months)

In the very late stages of the disease, progression is more rapid and you will see forelimb involvement with muscle mass loss to the shoulders and forelimbs. As the disease progresses, your dog will develop weakness in all 4 legs. Eventually, your dog will be unable to stand or walk. There may be residual head movement at this stage and they will not be able to remain sternal (on their belly) without assistance. The disease will then progress to the brain stem and eventually to the cranial nerves that may affect breathing.

The nervous system's spinal cord and brain stem are the only structures affected by DM. However weakness from DM can have secondary effects such as decubitus ulcers (pressure sores), systemic infections, and urinary tract infections due to urine retention. There can be kidney, lung, and heart failure. Death from DM results from multisystem failure.

Problems:

- Immobility
- Incontinence
- Systemic infections
- Decubitus ulcers
- Quality of life issues

Helpful Tools:

- At this stage, a forelimb and hindlimb harness is essential to move your dog around.
- There are quadriplegic carts or wheelchairs available that will allow you to move your dog around outside for walks.
- Constant vigilance will be required to prevent decubitus ulcers (turning schedules), urine scalding, and sores or infections on the paws.
- Awareness of systemic problems such as bladder infections must be monitored.
- Euthanasia will become a higher consideration.

Treatment

- Exercise will help to prolong you dog's muscle mass and mobility.
- Aquatic therapy of either walking or swimming can even be more useful than walking. To date, professional canine rehabilitation (physical therapy) is the only treatment that has been shown to improve quality of life and longevity.
- Increased awareness of the level of nursing care necessary to prevent secondary complications such as decubitus ulcers, urinary tract infections, and foot damage is also very important.
- The use of harnesses to assist in your dog's mobility and also increase your ability to move your dog

around are also considerations.

- A cart or a progression of carts will not only improve your dog's mobility but his quality of life.
- Dr. Roger M. Clemmons, an associate professor of veterinary neurology and neurosurgery at the University of Florida's College of Veterinary Medicine, suggests that a combination of "diet, exercise, supplements, and medications" may "slow or stop the progression of the clinical signs." These statements have not been confirmed by peer-reviewed, controlled studies. Anecdotally, we have seen no significant difference in patients that were given these supplements/medications compared to those patients that did not receive them.

Diagnosis

Degenerative myelopathy is a diagnosis of exclusion, meaning that other diseases with similar clinical signs must first be excluded. At this time, there is no test that will definitively diagnose DM other than autopsy. However, a combination of tests can help provide a presumptive diagnosis of DM.

Physical and Neurological examination

- Used to determine whether or not a patient has neurological disease and if the clinical signs are compatible with a diagnosis of DM.

MRI or Myelogram

- Normal in patients with DM.
- Used to rule out other diseases with similar clinical signs, such as disk herniation, cancer, and inflammation/infection.

Lumbar cerebral spinal fluid (CSF)

- CSF protein may be elevated.
- CSF cell count should be normal.
- Infectious disease tests would be negative.
- Cholinesterase levels in CSF may be elevated.

DNA test

- Available through OFA (Orthopedic Foundation for Animals; www.offa.org).
- Not necessarily diagnostic but if your dog has 2 mutated copies of the SOD1 gene he is at greater risk from the disease. See additional information below.
- Available to veterinarians, breeders and owners.
- Requires Q-tip swab of cheek.
- Link – www.caninegeneticdiseases.net/DM/testDM.htm

DNA testing

There can be a fairly high percentage of dogs in some breeds for a mutation in the SOD1 gene. So far (testing through February of 2011) the gene mutation is present in over 70% of the Boxers, Pembroke Welsh Corgis, and Wire Fox Terriers. The percentage of the gene mutation is over 40% in another 10 breeds. This test is most useful to breeders and potential dog owners if the breeding stock is DNA tested and used as an evaluative and decision making tool.

The mutation in the gene that causes DM comes in two forms. The "N" and the "A" allele. The "N" allele is found in dogs that seldom or never get DM. The "A" allele is found more often in dogs that have clinical signs of DM. The results of the test reveal 3 possible outcomes: (1) two "N" alleles that could be considered normal or at very low risk of developing DM, (2) one "N" and one "A" allele that would be considered a carrier, and (3) two "A" alleles that would be indicative of a dog at risk or affected by DM. In all but two of the dogs tested so far with autopsy-confirmed DM, the DNA test result was of the double "A" alleles.

What Does the SOD1 Gene Test Tell Us?

This test is recommended primarily for breeding programs. The test tells us whether your dog is AT RISK for developing DM. It DOES NOT mean that your dog WILL develop DM. There are likely other genes involved in this condition, and researchers have not entirely ruled out a combination of hereditary and environmental factors. See the information below from the OFA Web site regarding breeding. If your dog currently has signs of DM, the test can be used to help presumptively diagnose the condition, but must be used in combination with other tests (eg, MRI) to rule out other diseases that require other treatments, such as surgery for a herniated disk.

From the OFA website: (www.offa.org)
"GUIDELINES FOR BREEDING DOGS WHO ARE CARRIERS OR AT RISK FOR DM"

"Owners with dogs testing as Carriers (A/N), or At-Risk (A/A) are strongly encouraged to share these results with their attending veterinarian and seek genetic counseling when making breeding decisions."

"The "A" (mutated) allele appears to be very common in some breeds. In these breeds, an overly aggressive breeding program to eliminate dogs testing A/A or A/N might be devastating to the breed as a whole because it would eliminate a large fraction of the high quality dogs that would otherwise contribute desirable qualities to the breed. Nonetheless, DM should be taken seriously. It is a fatal disease with devastating consequences for the dog, and can be a trying experience for the owners that care for them. A realistic approach when considering which dogs to select for breeding would be to treat the test results as one would treat any other undesirable trait or fault. Dogs testing At-Risk (A/A) should be considered to have a more serious fault than those testing as Carriers (A/N). Incorporating this information into their selection criteria, breeders can then proceed as conscientious breeders have always done: make their breeding selections based on all the dog's strengths and all the dog's faults. Using this approach and factoring the DM test results into the breeding decisions should reduce the prevalence of DM in the subsequent generations while continuing to maintain and improve upon positive, sought after traits."

"We recommend that breeders take into consideration the DM test results as they plan their breeding programs; however, they should not over-emphasize the test results. Instead the test result should be one factor among many in a balance breeding program."

Congratulations to the Following Orthopaedic Section Members Receiving Doctoral Scholarships from the Foundation for Physical Therapy:

Meryl Alappattu:
Promotion of Doctoral Studies (PODS) I Scholarship

Michael Bade:
PODS II Scholarship

Jaclyn Sions:
PODS II Scholarship

Orthopaedic Physical Therapy Practice

Instructions to Authors

Christopher J. Hughes, PT, PhD, OCS, Editor
Sharon L. Klinski, Managing Editor

1. *Orthopaedic Physical Therapy Practice (OPTP)* serves as a publication option for articles pertaining to clinical practice as well as governance of the orthopaedic section and corresponding Special Interest Groups (SIG). Articles describing treatment techniques as well as case studies, small sample studies and reviews of literature are acceptable. Papers on new and innovative technologies will also be considered for publication. Language and format of articles should be consistent with the *Guide to Physical Therapist Practice*. SIG authors must adhere to the 12 page limit when submitting articles as part of SIG report.

2. Manuscripts should be reports of personal experiences and written as such. Though suggested reading lists are welcomed, references should otherwise be kept to a minimum with the exception of reviews of literature. All authors are required to sign a consent form indicating verification of original work and this form must accompany your work at the time of submission. This form can be found on the Orthopaedic section website (www.orthopt.org) under the Orthopaedic Physical Therapy Practice link. Authors are solely responsible for proper citation of work and avoiding any issues with copyright infringement related to writing or use of images or figures. For more information on plagiarism authors may find the following resources helpful:
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4. **Article Review Process**
Authors will be immediately notified of receipt of document by managing editor. All initial reviews are done by the editor, managing editor, and also possibly a member of the advisory council of OP. A schematic of the review process is attached. Articles are reviewed in the order in which they are received. You will receive a confirmation of your submission and will be updated on the status of your work as we complete the review process. A schematic of the review process is attached.

5. **Manuscript Preparation Guidelines**
Title Page - include the author's name, degree, title, current place of work or affiliation, corresponding address, phone and FAX numbers, and email address.

Abstract - Abstract of 150 words or less using double space format. Abstracts at minimum should include the following headings: Background and Purpose, Methods, Findings, Clinical Relevance
Key words should also be listed after the abstract.

Format - text should be a minimum of 12 pages double-spaced, use a 12-point font; margins should be 1 inch on each side. Headings should be formatted as follows:
MAIN HEADING
Secondary Heading
Tertiary heading

Citation of Reference List - references should be numbered sequentially as they appear in the text and should correspond to the superscript number in the text. Do not repeat the same reference using a different number in the reference list. Only references cited in the paper should be listed.

Journal Articles

16. Ferguson CT, Cherniack RM. Current concepts: management of COPD. *N Engl J Med*. 1993;328:1017-1022.
17. Rueben DB, Siu AL. An objective measure of physical function of elderly outpatients (The Physical Performance Test). *J Am Geriatri Soc*. 990;38:1105-1112.

Books

18. Steindler A. *Kinesiology of the Human Body Under Normal and Pathological Conditions*. Springfield, Ill: Charles C. Thomas; 1995:63-64.

Abbreviate United States state and territory names as specified in the *American Medical Association Manual of Style*—NOT according to the United States Postal Service abbreviations.

Editor(s) as author:

19. Scully RM, Barnes ML, eds. *Physical Therapy*. Philadelphia, Pa: JB Lippincott Co; 1989:83-98.

Reference to part of a book:

20. Goodman CC. The endocrine and metabolic systems. IN: Goodman CC, Boissonault WG, eds. *Pathology: Implications for the Physical Therapist*. Philadelphia, Pa: WB Saunders; 1997.

Tables - provide tables to present information more clearly and concisely than if presented in the text. Table titles are usually written as phrases. They are capitalized in title case and do not employ terminal punctuation:

Table 1. Symptoms of Chronic Fatigue Syndrome

Reference to a Web site:
Information on Total Knee Replacements. American Academy of Orthopedic Surgeons. www.aaos.org/wordhtml/research/oainfo/OAinfo_knee_state. Accessed on September 5, 2005.

Format and Presentation of Figures, Graphics, and Tables

Figures and Graphics:

- Figures should be submitted as separate, high-resolution graphic files in TIF, JPG, EPS, or PDF format, with the resolution set at a minimum of 300 dpi. Rule of thumb: the larger the figure (eg, 8 1/2" x 11"), the better. Figures – prepare as 5 x 7 black and white photographs, camera-ready artwork (eg, line drawings and graphs), or as professional-quality computer file images. A photo release form must accompany any photographs where patients may be seen. Figure legends may be phrases or complete sentences, capitalized in sentence case, and end with a period:

Figure 2. Kinesthetic testing using an electronic inclinometer.

If electronic formats are not available to you, figures must be submitted as 5" x 7" camera-ready glossies and mailed to the Editorial Office. Figures should be numbered consecutively. For helpful guidelines on submitting figures online, visit Cadmus Journal Services (http://www.cadmus.com/). Lettering should be large, sharp, and clear, and abbreviations used within figures should agree with Journal style. Color photographs are encouraged but must be of excellent resolution and good contrast.

- Legends to Figures. Type all legends on one page after the reference list and tables.

- Tables should be formatted in Word and placed together at the end of the manuscript, after the references. Tables should be numbered consecutively. Refer to recent issues for acceptable table formats.

3. Manuscripts are only accepted electronically. **Save your monograph in Microsoft Word or plain text format.** If figures cannot be sent electronically then prepare the content of any original photographs and artwork for shipment. Include a cover letter indicating author and title of the paper the photographs or artwork are to be used for. Send to:

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