ORTHOPAEDIC PHYSICAL THERAPY PRACTICE

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VOL. 16, NO. 4 2004

APTA
American Physical Therapy Association
The Science of Healing. The Art of Caring.

Orthopaedic Interventions for Pediatric Patients: The Evidence for Effectiveness

An Independent Study Course Designed for Individual Continuing Education

CONTINUING PHYSICAL THERAPY EDUCATION

Topics and Authors

15.1.1 **Lower Extremity Orthopaedic Interventions in Patients with Cerebral Palsy—**Carolyn Vaillancourt, PT, MS, NCS, MBA

15.1.2 **Torticollis—**Gena Lentz-Livingston, PT and Sandra Saluti, PT, MS

15.1.3 **Idiopathic Toe Walking—**Nancy Dilger, PT, MA, PCS

15.1.4 **Overuse Injuries in Young Athletes—**Mary Ann Wilmarth, PT, DPT, MS, OCS, MTC, Cert MDT and Barbara Ann Fenton, PT, MS; *Subject Matter Expert*—Lori Thein Brody, PT, MS, SCS

15.1.5 **Pediatric Patients With HIV—**Meredith H. Harris, PT, EdD

15.1.6 **Physical Therapy Management of Adolescent Idiopathic Scoliosis—**Kathleen Richards, PT, PCS; Michelina Cassella, PT; and Jennifer Connors, PT, MS

Editor

Mary Ann Wilmarth, PT, DPT, MS, OCS, MTC, Cert MDT

Course Objectives

1. Implement an evidence-based approach to evaluation, assessment, and treatment of pediatric patients.
2. Recognize the signs and symptoms associated with the diagnoses as well as those that are suggestive of non-mechanical dysfunction or disease.
3. Analyze and understand anatomical and biomechanical considerations of specific joints and structures that may potentially influence the dysfunctions and disorders discussed with each diagnosis.
4. Understand the indications for clinical tests as they relate to specific dysfunctions and disorders.
5. Develop a working treatment hypothesis based on patient history and physical examination findings.
6. Interpret the advantages and disadvantages of various intervention approaches in physical therapy management based on evidence published in the literature.
7. Develop a decision-making process of intervention based on the most relevant published research and incorporate effective interventions into the treatment of the patient.
8. Understand the specific medical and therapeutic concerns of the pediatric patient.
9. Identify incidence, various etiologies, and differential diagnoses.
10. Identify symptoms, common impairments, and musculoskeletal implications.
11. Determine appropriate conservative treatment strategies to effectively treat impairments.
12. Determine when it is appropriate to consult with a specialist regarding more aggressive treatment.

APTA American Physical Therapy Association *The Science of Healing. The Art of Caring.*

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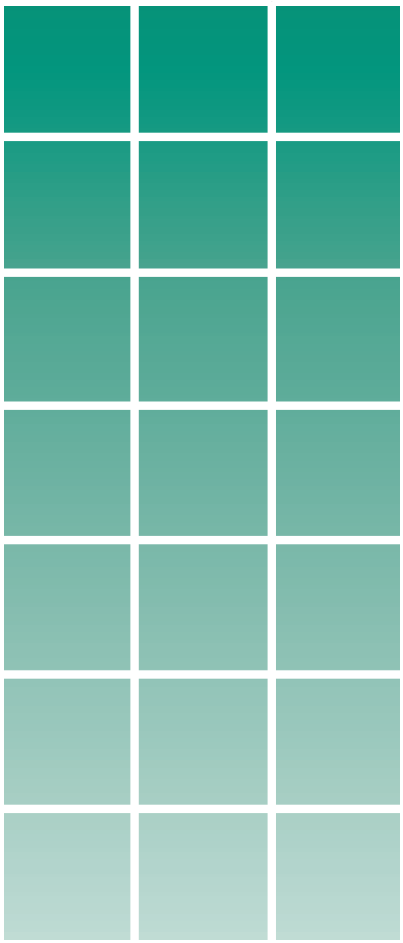

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The mission of the Orthopaedic Section of the American Physical Therapy Association is to be the leading advocate and resource for the practice of Orthopaedic Physical Therapy. The Section will serve its members by fostering quality patient/client care and promoting professional growth through:

- enhancement of clinical practice,
- advancement of education, and
- facilitation of quality research.

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President's Message

Fall 2004

While I write this President's Message, the United States of America is in the middle of an election year. The issues at hand appear both so similar and yet so far apart. How each candidate would handle Iraq, homeland security, or international relations with North Korea are different. The President, as our chief, sets the tone for America's home and foreign policy. Whoever wins this President's election will not only have the nation's highest office for the next 4 years but also the ability to pick the next 2 maybe 3 Supreme Court justices who can and often do make groundbreaking decisions. Such decisions may have a profound affect on each and every one of us during our lifetime and for the future. As President of the Orthopaedic Section I don't hold such power, but thankfully by virtue of this message, I am given a voice to express my opinion. I hope, by this message, I can encourage you as members, to become more involved in making decisions that affect orthopaedic PT practice.

Governance is a freedom we enjoy in the United States. Our democracy is a liberty and a right we are given by being born here. Here in America I think we often take our democracy for granted. For those who are born in autocratic regimes where life and death can be taken away at the whim of the autocrat, our democracy is something special. They have seen what an oppressive government can do. That is why people come to America since the pilgrims, to seek freedom, liberty, and the pursuit of happiness. Freedom is something that should be valued and honored.

America would not be such a wonderful place if it were not for our founding fathers. They sacrificed their life in an effort to create a democracy that was long lasting. They would rather die than have their liberty and freedom taken away. Our problems with England began when they tried to rule over a land that was vast, far away, and where people tasted the fruits of liberty and freedom from government. Governance by England was considered oppressive and unfair to the American colonist. King George did not understand the vast differences that developed between England and America or the problem of ruling a land from such a far distance. The colonist rebelled and created a new country. In this President's Message, I am going to stress 2 important principles of a good democracy—independence of thought and action and the importance of being an active, involved citizen.

The formation of our new country was based on the Declaration of Independence. We wanted to free ourselves from the fetters of England. Independence is indispensable to the pursuit of happiness. As an orthopaedic physical therapist, I want to make my patient's happy which then makes me happy. For me to be happy, I must have my independence. Thus first and foremost, I must be able to see my patients without a referral from a doctor. I have been working for 26 years now; 21 in an orthopaedic physical therapy outpatient clinic and I want to be free. Ninety-nine percent of my referrals are nominal, nondescriptive descriptions, not diagnosis—shoulder pain, shoulder strain, hip pain, knee strain, etc. I have 26 years of experience that tells me that if a shoulder joint (or lumbar facet, hip, etc.) is missing range of motion, that person will have some shoulder or arm pain and when I restore that shoulder motion they will feel better (today or tomorrow). To me this is the most basic aphorism or tenet of orthopaedic physical therapy. It's almost too basic to even question (although we must). It is also the most basic of all orthopaedic principles and what most of our treatments are based on—restoring motion. Anyone who has ever worked with a frozen shoulder knows that as range of motion increases pain and disability do likewise. We also know from both experience and evidence that if we mobilize or manipulate a lumbar facet joint that is missing motion we often times can provide dramatic relief. These simple anecdotes that I see everyday are what I believe must be stressed to gain our independence. How or why should we be denied the ability, the ability that we possess, to restore simple joint motion? I don't need the dependence of a doctor to tell me that a joint is missing motion (that is why I am an expert), or on the other hand and equally important, I don't need someone to tell me that I cannot help a patient. I should know that; and if I don't, I do not deserve independence. I want my freedom to practice in such a way I can help my patients to achieve their full potential!

Now I do occasionally get specific referrals; usually they are from an Orthopaedic surgeon after trauma (fractured nondisplaced 1st metacarpal) or surgery (ACL repair using the middle third of the patellar tendon). Saying I want independence does not say I don't want to work with the Orthopaedic Surgeons in the rehabilitation of their patients. It does say I want a more professional role. I want to be considered as an equal rank. I want to be noted as THE rehab specialist, not a technician. Today I often still get very specific rehab protocols from most of my referring Orthopaedic Surgeons. Don't they trust us? Many of the protocols are different even though the diagnosis and surgery may be the same. Passive range of motion for 4 weeks, maybe 5, in some 6 weeks, don't do this, don't do that. Are we that bad? Don't we know what we are doing? Sometimes I feel like a flunky chef following a bad recipe. I occasionally ask the doctor where the protocol came from and I get a copy out of a book written by an orthopaedic surgeon with no real evidence, no cogent references, just a popular orthopaedic surgeon. Where did the information come from? Who knows, maybe from some physical therapist who jotted this down on a post-it-note. Why do we tolerate this? Now I know it's because right now we have to (money talks); however, I hope before I retire this will change. As long as we have others, who are not PTs, telling us what to do in our own area of expertise, we will never be free.

Having independence and freedom also comes with certain obligations. Independence is a privilege granted to us by the constitution of the United States. To insure our freedom and independence, we must be active and involved in our government. Voting, expressing our opinion, being vigilant of government spending, or legislator's voting patterns, etc. are ways we can be active in our government. Our obligation in a democratic government is to make sure that our leaders work within the constitution and not stray into anarchy. This is our obligation, no one elses, and it requires thoughtful reflection on picking the right rulers/leaders and making sure that government is working for the people (demos). For those who do not take voting and the care of our government serious, in my opinion, have no right to criticize the government's action.

How do we become active? First and foremost—for those who already are members, by staying a member; and for those that are not, to become a member. Second, become involved and stay involved. You don't have to be on the Board or be President, just stay active and voice your opinion. Support APTA's initiatives by contacting your Senator and Congressman for issues like Medicare Direct Access, utilization of the PTA in outpatient PT practices, etc. The squeaky wheel gets the oil; we must be that squeaky wheel. Let me know if you want to be involved in a group or committee. Every year I receive an appointed group form from APTA asking me for names of people who would be interested in being on an APTA committee. Write me, e-mail me, let me know your interested. I, along with the Orthopaedic Section Board of Directors, have made a concerted effort to get new members involved. We have reconfigured the standing committees that will allow more members access by staggering and limiting terms, expanding numbers, and trying to increase geographic representation. I ask you please to get involved, vote, make your opinions known, and support what you believe in. I hope we can all strive to become active members! Be squeaky!!

Orthopaedically yours,
Michael T. Cibulka, PT, MHS, OCS
President, Orthopaedic Section, APTA Inc.

Editor's Corner

Our Value….Our Pride

Sometimes one never knows the value placed on their work effort until the work is seen through the eyes of another. This seems to be the case in physical therapy. I am sure we all remember the gratefulness of patients who demonstrate the appreciation of our efforts to restore their function by saying thanks, sending a card, or even bringing in food (yes, food seems to be the highest reward for a job well done!). Value is tied to need. A situation of extreme need often elevates the value of the service. When your car breaks down on the highway, a tow truck heading your way becomes a welcome sight. A plumber becomes the most important person on earth when you have a leaky pipe and of course let's not forget how thankful we are when electricity comes back on in the house!

This same feeling of need or value can be seen in patients who come to us seeking care to relieve their pain so they can get back to the things they enjoy in life. What we view as "all in a days work" often has significant impact on a patient's well being. Often our treatments allow patients to get through a weekend without movement restriction, be able to simply walk up a flight of stairs without pain, or even get a restful night sleep following surgery. We can even be the one professional who inevitably helps a patient avoid surgery.

In times when other entities such as insurance companies have placed undervalue on our services, we must still not forget who truly the customer is and who ultimately defines our relative worth or value…the recipient of our care…the patient.

As patient care providers, we must never let anything inhibit our commitment to the patient. If we do, then the value placed on our skills in performing the service will ultimately suffer. This loss of perceived value can become the first step in a downward spiral leading to a loss of confidence in the utility of our efforts and eventually the respect of the profession.

Whereas the value of our work is based on the opinion provided by others, our pride is deeply rooted in our inner drive to meet our own expectations or self worth.

Pride can sometimes be dampened by circumstance. Ironically, when times were tough in the profession due to changes in reimbursement and market changes most of the negative remarks on the profession actually came from the therapists themselves and not from those wanting to become therapists. Yes, enrollments in educational programs declined, but the applicants who did enroll truly wanted to be there for the right reasons. One reason being to fulfill their dream of being part of profession that they could be proud of. I am sure many of you hear patients talk about how lucky we are to be in a profession that helps people. On days when we work long hours those credible statements serve to rekindle the fire of pride and passion in our work. We truly do make a difference and our patients know it.

As a faculty member, I get emails on a regular basis from interested high school and college students who have always wanted to be a therapist and their enthusiasm comes through in their writing. How refreshing that is to know that the next generation of recruits can still possess the inner devotion and pride to succeed in the field. As educators and clinicians we are important role models, and we must continually mentor persons who carry this pride.

In the end I am not sure which comes first value or pride…but one thing is certain, if we deliver care to the best of our ability we won't have to choose between the two. Let us never forget why we do what we do and the impact it can have on our patients. The responsibilities are challenging but the rewards offer so much more.

The authors in this issue have shown dedication in putting pen to paper and expressing their views on clinical practice. My hope is that each reader will find value in such efforts and develop a sense of pride in learning as much as they can about clinical practice.

Christopher Hughes, PT, PhD, OCS
Editor, OP

Vertebral Artery Testing as a Clinical Screen for Vertebrobasilar Insufficiency: Is There Any Diagnostic Value?

Paul G. Vidal, PT, DPT, MHSc, OCS, MTC

INTRODUCTION

The purposes of this paper are to critically evaluate the diagnostic accuracy of the vertebral artery test (VAT) as a clinical screening tool for vertebrobasilar insufficiency (VBI) and to generate a clinical opinion about its use. The VAT is designed to mechanically compromise the vertebral artery, usually through cervical spine extension and rotation and to assess the patency of blood flow to the brain by the collateral circulation. Performing the VAT on patients is a debated and controversial topic among health care providers practicing cervical spine manipulation. Knowledge of the anatomical course of the vertebral artery, the pathophysiology of VBI, the hemodynamic changes that occur in the vertebral artery with cervical spine motion and with the VAT, and the research that has investigated the psychometric properties of the VAT would appear to assist the health care provider in making an informed decision about the diagnostic accuracy and value of the VAT as a clinical screening tool for VBI.

ANATOMY OF THE VERTEBRAL ARTERY

The vertebral artery (VA) has its origin from the subclavian artery, which arises from the arch of the aorta. The VA runs a superior course to reach the brainstem. This superior course can be divided into 4 parts[1,2]:

1. from the subclavian artery to the C6 transverse foramen,
2. through the transverse foramen of the upper 6 cervical vertebrae (C6-C1),
3. horizontal course across the posterior arch of the atlas, and
4. entering the foramen magnum to unite with the other VA to form the basilar artery.

The VA has important relations with soft tissue and bony structures along its superior course to the brainstem. These relationships can become a source of compromised blood flow.[1]

First Part of Vertebral Artery

The first part of the VA runs between the anterior scalene and longus colli muscles.[1,3] The tendinous insertions of the medial scalene also has a relationship with the first part of the VA.[3] Tightness of these muscles or cervical fascial bands have been reported to cause external compression of the VA.[3] The uncinate processes of the vertebral bodies and the superior articular processes of the facet joints sit closely to the VA as it courses through the transverse foramen of C6 to C2.[1]

Second Part of Vertebral Artery

In the transverse foramen, the VA has a snug fit and is relatively fixed.[1,4] Bony changes, such as osteophytes, and other changes related to cervical spondylosis may compress the second part of the VA.[1,3]

Third Part of Vertebral Artery

As the vertebral artery exits the C2 transverse foramen, it courses obliquely to the C1 transverse foramen.[3] At the level of the atlantoaxial joint, the VA can be compressed by fibers from the inferior capitis oblique and intertransversarius muscles.[3] It is at this level that the VA is subjected to the most mechanical stress, as >50% of cervical spine rotation occurs here.[1,5,6]

Fourth Part of Vertebral Artery

Upon exiting the C1 transverse foramen, the VA courses posteriorly at right angles and runs around the superior part of the lateral mass of the atlas.[3] At this level, the VA can be compressed by the atlanto-occipital membrane, as well as by the approximation of the occiput to axis in the forward head posture.[3,7]

PATHOPHYISIOLOGY OF VERTEBROBASILAR INSUFFICIENCY

Vertebrobasilar insufficiency (VBI) has been defined as dizziness symptoms associated with focal neurologic abnormalities of sudden onset and brief duration that relate to the specific areas that are supplied by the vertebrobasilar vessels.[8] Accompanying neurologic abnormalities, as a result of reduced blood supply to an area of the brain, may include: dizziness, visual disturbance, drop attacks, ataxia, dysarthria, dysphagia, hemiplegia, hemianesthesia, nausea, and ringing in the ears.[1,9] The related vessels include: vertebral arteries, basilar arteries, posterior inferior cerebellar arteries, anterior inferior cerebellar arteries, and the superior cerebellar arteries.[9] Owing to the different areas of the brain that these arteries supply, dizziness, although the most common and usual symptom is rarely an isolated symptom with VBI, especially in advanced stages of the condition.[1]

Disturbances of blood flow in the VA may be due to mechanical disorders. Mechanical disorders can be classified as intrinsic or extrinsic. Atherosclerosis, thromboembolic events, and arterial dissection are examples of intrinsic mechanical disorders.[1,10,11] Anomalous soft tissue structures, such as bands of the deep cervical fascia, or compression of the vertebral artery between the longus colli and anterior scalene muscles are examples of extrinsic mechanical disorders.[1] Osteophytes laterally projecting from the uncinate processes and backward bending of the upper cervical spine in the forward head posture also may cause external mechanical compression.[7] Intrinsic and extrinsic disorders can compromise the lumen of the VA and disrupt blood flow. Additionally, vertebral artery occlusion may result following acute cervical spine trauma causing fracture and dislocation.[12]

Abnormal stress on the VA causing an alteration in blood flow also can occur with rotational head motion,[3] which is of particular interest to health care providers practicing cervical spine manipulation. Stroke following rotational manipulations to the upper cervical spine has been estimated at 1 case per 400,000 treatment sessions.[4] Frisoni and Anzola[5] concluded that VA dissection at the atlantoaxial joint with intimal tear, intramural bleeding, or pseudoaneurysm leading to thrombosis or embolism is the mechanism for VBI following chiropractic manipulation. Frisoni and Anzola[5] found that possible risk factors for VBI after neck motion are VA size asymmetry, anomalous course of VA, atherosclerosis, osteoarthritis, and vertebral ligament laxity.

There is an inherent redundancy of the vascular supply to the brain. Therefore, the brain does not rely on one particular vessel for blood. The posterior vessels, listed earlier, and the anterior vessels stemming from the internal carotid arteries, create an anastomotic network via the circle of Willis. In this respect, symptoms of VBI may not be present if

there is stenosis or an occlusion of one VA. Occlusion of the left VA may be compensated for by the right VA, the occipital artery, the ascending and deep cervical arteries, and from the internal carotid arteries.[1] In fact, there is evidence that suggests that blood flow velocity and blood flow volume increase in the arteries that compensate for occlusion in another vessel.[13] However, as stated by Bogduk,[1] symptoms of VBI are more likely to occur if these compensating mechanisms are not available due to intrinsic and extrinsic mechanical disorders, as well as from congenital abnormalities. Knowledge of a patient's past medical history is evident. The inherent redundancy of the vascular supply to the brain may be responsible for a negative finding during vertebral artery testing, calling into question the diagnostic accuracy of the VAT.

HEMODYNAMIC CHANGES IN THE VERTEBRAL ARTERY

Before discussing the hemodynamic changes that occur in the VA in response to cervical spine movement (rotation) and during the VAT, an understanding of the 'vessel-mobility' during rotation is warranted. According to Licht et al,[14] stress to the VA has been demonstrated both ipsilaterally and contralaterally. However, it is the contralateral VA that demonstrated the most mobility and change in angulation when studied via magnetic resonance angiography.[15] Given that >50% of cervical spine rotation motion occurs at the atlantoaxial joint, the discussion on 'vessel-mobility' will focus at the C1-C2 level.

Vessel Mobility

Stress to the VA, at the C1-C2 level, is thought to occur during cervical spine rotation, either via compression, stretching, or kinking. Haynes et al[16] studied the effects of atlantoaxial rotation on the lumen dimension of the VA. There objective was to determine whether lumen narrowing in VAs during atlantoaxial rotation is due to localized compression or stretching. The study involved a model of the VA at the C1-C2 level, cadaver specimens, and 8 human subjects. There results demonstrated that no change in lumen dimension occurred in the 8 human subjects with full cervical spine rotation. The model and cadaver specimens demonstrated compression or kinking of the vessel wall with end range rotation as it exited the C2 transverse foramen. No significant evidence was found to support the theory that stretching contributes to lumen stenosis. The results were observed in the contralateral VA. No significant changes were found in the ipsilateral VA.

When studying the effects of contralateral atlantoaxial rotation, Dumas et al,[15] reported on 5 factors that might explain why compression of the VAs may or may not occur. The first factor is the morphology of the third part of the VA at the atlantoaxial joint, described as a posterolateral loop. A well-developed loop would prevent excessive stretching to the VA compared to an under-developed loop that has less 'slack' at any given amount of cervical rotation.

The second factor was the amount of rotation that occurred at C1-C2. Rotation >35º was considered a risk factor for blood flow disturbance in the vertebral artery.[15] Haynes et al[16] found in their model and cadavers, that stenosis due to compression of the VA, occurred at the end range of contralateral atlantoaxial rotation, which was approximately 45º. Dumas et al,[15] via magnetic resonance angiography, found that subjects who demonstrated >35º of atlantoaxial rotation and had an under-developed posterolateral loop demonstrated flow disturbance. In comparison, subjects that had either an under-developed loop or rotation >35º did not develop any blood flow disturbance.[15] Likewise, subjects that possessed both a well-developed loop and C1-C2 rotation <35º demonstrated no disturbance in blood flow.[15] Based on this, a patient whose artery is most susceptible to compression during cervical spine rotation is when they exhibit an under-developed posterolateral loop and atlantoaxial rotation >35º. Dumas et al[15] reported that all demonstrated flow disturbances occurred in the contralateral VA. Flow signals remained stable in the ipsilateral VA.

The third factor that affects the stress of the VA during rotation is the concurrent contralateral lateral flexion that occurs in the upper cervical spine. Contralateral lateral flexion occurs during rotation due to the involvement of ligamentous structures (alar ligament) and the orientation of the articular surfaces.[2,17] Contralateral lateral flexion approximates the C1 and C2 transverse processes, thus slackening the VA at this level.[16] Haynes et al[16] theorized that the combination of contralateral lateral flexion and a well-developed loop is the reason why stretching of the VA does not significantly occur when the atlas and axis transverse processes separate during rotation, as well as why there was no change in lumen dimension in human subjects.

The intraluminal pressure of the VA is the fourth factor in determining if stenosis, via compression, occurs with cervical rotation. Haynes and colleagues[16] gathered evidence that higher intraluminal pressure in the VA resulted in less stenosis during cervical rotation. In their model, the amount of compression was greatest at 40 mmHg of air pressure and decreased by 10 mmHg increments up to 180 mm pressure.

The fifth and final factor is the reduction in cross sectional area of the VA required to cause changes in Doppler signals. Haynes et al[16] reported that a 56% reduction in the cross sectional area of the VA is required to cause changes in Doppler signals. This reduction occurs when the VA is stretched by 65%. However, Haynes et al[16] were able to demonstrate using their VA model, that a stretch of only 42% during atlantoaxial rotation occurred when there was a poorly developed loop and no contralateral lateral flexion. Without the 'protective features' against stretch during rotation, the VA still was not able to stretch to the point needed to alter Doppler signals.

Hemodynamic Changes

Haynes[18] investigated the effects of cervical contralateral rotation and cervical contralateral lateral flexion on vertebral artery flow velocity using Doppler ultrasound velocimetry. Haynes[18] concluded that VA Doppler signals can be greatly reduced or extinguished during contralateral rotation; however, this was an uncommon finding occurring in about 5% of the tested population. Additionally, he concluded it appears that less mechanical stress is placed on the artery during contralateral lateral flexion.

In a comprehensive review of the literature, Haynes[4] found that a major restriction in blood flow during contralateral rotation, measured via velocimetry, occurred significantly more in patients with a history of transient ischemic attacks (TIA) compared to a matched control group. Blood flow restriction occurred in 33% of the TIA group compared to about 6% in the control group. It was suggested that stenosis of the VAs during cervical rotation is an independent risk factor for stroke.[4] It is worth mentioning here again, that risk factors for VBI after neck motion may include atherosclerosis, osteoarthritis, and ligament laxity. Clinical implications regarding the VAT are evident.

Licht et al[14] studied measured VA volume blood flow, rather than flow velocity, via duplex sonography. They felt studying volume blood flow was more inter-

esting than flow velocity because volume of flow is related to perfusion. It was found that volume blood flow during rotation did not change in symptom-free subjects. Additionally, no change in volume blood flow occurred after cervical manipulation. In a similar study by Licht et al,[19] volume blood flow in the VAs actually increased for 40 seconds following cervical manipulation before returning to premanipulation levels. Although Licht et al[19] did not offer a reason for this finding, Haynes et al[16] felt that the increase in volume blood flow may have been a hyperemic response due to stenosis of the VA from compression during manipulation. Haynes et al[16] theorized that temporary ischemia can trigger vasodilation resulting in increased blood flow. Licht et al[19] also found that DeKleyn's test, a premanipulative test of the VAs involving cervical rotation and extension, had no effect on volume blood flow. When measuring flow velocity following cervical manipulation in healthy subjects, Licht et al[20] found no significant changes. In this study, however, cervical manipulation did not involve rotation, but lateral flexion.

DIAGNOSTIC ACCURACY OF THE VERTEBRAL ARTERY TEST

Since ischemia can be a reality associated with cervical manipulation, premanipulative testing of the VA is thought to be able to identify patients who are at risk for VBI following manipulation. The VAT may be performed in weightbearing (seated) and nonweightbearing (supine) positions. In both variations, the patient's head is passively rotated to the available end-range and then extended and held for about 30 seconds.[2,21] The patient is engaged in 'yes' and 'no' questions, while the examiner observes for nystagmus, dysarthria, pupil changes, signs of distress, and a slowed response to questions.[2] A positive test, generally described as an onset of dizziness with associated neurological signs, is considered to be a contraindication to cervical manipulation.[21,22] Beliefs on premanipulative testing range from being a prudent act to one that is not a valid test that has an associated performance risk.[2,4,23] In addition, argument and varying expert opinion exists regarding the proper position and procedures to follow for the VAT.[2] According to Haynes,[4] the most serious question regarding the VAT is that it lacks the sensitivity to detect abnormality.

Doppler ultrasonography studies have investigated hemodynamic changes to the VA. Rivett et al[24] studied the position of combined end range contralateral rotation and extension. The subjects involved were 10 patients with a positive VAT and 10 subjects with a negative VAT. They found significant changes in flow velocity of the VA in the position of contralateral rotation and extension; however, no meaningful differences were found between the two groups. Despite this finding, the authors conclude that the VAT may be useful in testing the adequacy of collateral circulation.

Refshauge[25] found that end range contralateral rotation diminished blood flow to the brain. Refshauge[25] reported that end range rotation caused the reduction in vessel diameter that reached a critical point where blood could no longer flow. Based on this, she concluded that rotation is a valid test of adequacy of the extracranial vessels. However, an interesting point by Reshauge[25] was that cervical spine rotation does not test the blood vessels for their ability to resist external forces applied during manipulation. Another point by Refshauge[25] was that normally a reduction in blood flow is adequately compensated for and symptoms of VBI are not produced, but in cases of inadequate compensation, symptoms may be provoked.

Licht et al[22] concluded that a positive premanipulative test is not an absolute contraindication to manipulation of the cervical spine. In their study, they measured VA blood flow in patients (N=15) with a positive VAT. They found no significant difference in peak flow velocity with different head positions (neutral, 45° rotation, end range rotation). In a similar study by Licht et al,[26] there were no significant differences in flow velocity (either decrease or increase) of the internal carotid arteries during the different head positions in patients with a positive VAT. Based on their 2 studies, the authors felt that premanipulative testing is of little diagnostic value in detecting VBI as a potential complication after manipulation.

Terenzi[27] reports on a case describing a 28-year-old woman with complaints of neck pain, right arm pain, headaches, and dizziness. The VAT was negative. However, transcranial Doppler was able to detect a reproducible deficit in blood flow with cervical rotation and extension with the patient seated. Magnetic resonance imaging/angiography detected an anomalous circle of Willis. With the exception of dizziness, the patient's symptoms improved with a flexion-type manipulation technique. The authors concluded that manipulation may be safely used on patients with VBI if knowledge of cervical biomechanics and hemodynamic test results are known. The outcome of the VAT in this case was described as a false negative finding.

A study by Cote et al[28] contributes significant evidence to the psychometric properties of the VAT. The study included 12 subjects with a positive VAT and 30 healthy control subjects. Each subject underwent Doppler ultrasonography examination of their VAs with the neck extended and rotated. No description of the subject's position, seated or supine, was mentioned. Upon statistical analysis, the VAT demonstrated 0% sensitivity. According to Cote et al,[28] this meant that symptoms observed during and after the VAT cannot be attributed to an increased impedance to blood flow. The authors stated that this raised more questions regarding the proposed etiological mechanism by which the VAT is believed to reproduce symptoms. Additionally, the statistical analysis showed a 0% positive predictive value. Meaning, the subjects who had a positive VAT demonstrated no decrease in blood flow velocity in the VAs during the VAT, as measured by Doppler examination. The negative predictive values were better, but based on the case by Terenzi,[27] false negative outcomes can occur. The authors concluded that the diagnostic accuracy of the VAT in screening patients at risk for stroke following cervical manipulation is questionable.

DISCUSSION

Based on the conflicting evidence regarding the diagnostic accuracy of the VAT, it is obvious that the clinical use of the VAT as a screening tool for VBI is controversial. It would appear, based on the evidence presented in this paper, that 9 factors contribute to the existing controversy (Table 1).

First, the inherent redundancy of the vascular supply to the brain acts as a 'safety mechanism' when blood flow is altered in a vessel. This, of course, is assuming that the collateral circulation is intact. As Bogduk[1] reported, symptoms of VBI are more likely to occur if these compensating mechanisms are not available due to intrinsic and extrinsic mechanical disorders, as well as from congenital abnormalities.

Second and third factors would be the morphology of the VA at the atlantoaxial level and the biomechanics of the upper cervical spine. Dumas et al[15] described a well-developed posterior loop as a 'protective factor' against stretch of the VA at the atlantoaxial level during rotation. The concurrent contralateral lateral flexion that occurs with cervical rotation might be described in the same manner, as it decreases the tension in the VA at the

Table 1. Nine Factors to Consider with the VAT

Inherent redundancy of blood supply
• collateral circulation
Morphology of VA at the atlantoaxial level
• poorly developed loop vs. well developed loop
Biomechanics of upper cervical spine
• concurrent contralateral lateral flexion with cervical rotation
Nonvascular causes of dizziness
• cervicogenic dizziness and BPPV
Amount of cervical rotation
• end-range rotation may mechanically compromise the VA
Past medical history
• TIA, CVA, cardiac risk factors, cervical spondylosis
Psychometric properties of VAT
• 0% sensitivity
Applied force
• VAT vs. manipulation
Risk of injury with manipulation
• Thrust, rotational techniques vs. non-thrust, non-rotational techniques

atlantoaxial level. In the normal healthy population, only about 5% of VA demonstrated stenosis, via compression, during cervical rotation.[16] So the question begs, "Are we truly stressing the VA during rotation if these protective factors exist?" Or, is there another etiological mechanism responsible in those patients that test positive during a VAT?

Competing diagnoses are the fourth factor. Nonvascular causes of dizziness from the cervical spine can be provoked with cervical rotation and extension. This has been attributed to irritated muscle spindles or irritated mechanoreceptors in the facet joint capsules of the upper cervical spine.[2,29] This condition is called cervicogenic dizziness. Peripheral vestibular dysfunction also may present in the position of cervical spine rotation and extension. A condition known as benign paroxysmal positional vertigo (BPPV) is caused by the shifting of free-floating otoconia (calcium carbonate crystals) in the posterior semi-circular canal.[30] The clinical test used to detect BPPV is called the Hallpike-Dix maneuver.[30] The end position of this test is very similar to that of the VAT position. Hallmark symptoms of BPPV are the onset of dizziness and nystagmus, which can be misinterpreted as a positive VAT resulting in a false positive finding. In general, signs and symptoms of BPPV are seconds in duration, whereas VBI signs and symptoms may persist if the offending position is maintained.

The fifth factor to discuss is the amount of rotation present in the cervical spine. Dumas et al[15] found that those subjects with >35° of axial rotation combined with a poorly developed posterior loop had a disturbance in blood flow in the contralateral VA. Haynes et al[16] and Refshauge[25] also found that compression of the VA occurred at the end range of cervical rotation. Thus, it appears that if a VAT is able to detect VBI, that the test needs to be performed at end range rotation (>35° axial rotation). With this said, clinicians who perform the VAT should repeat the test as their patient's range of motion improves. Failure to do so would suggest that the VA was inadequately stressed during the test, producing a false negative finding.

Given that 33% of a group of subjects with a history of TIA compared to 6% without TIA had blood flow occlusion with rotation,[4] makes knowledge of a patient's past medical history a sixth important factor in determining risk of VBI postcervical manipulation. A past medical history remarkable for TIA, CVA, syncope, lightheadedness, fatigue, and/or dyspnea may suggest coronary artery disease or other ischemic processes.[31] Knowing that the arch of the aorta gives rise to the subclavian artery, which gives rise to the vertebral artery, coronary artery disease may play a role in VBI. Cardiac risk factors: smoking history, hyperlipidemia, obesity, family history of myocardial infarction, diabetes, and sedentary lifestyle, increase the likelihood of cardiovascular involvement.[32] Additionally, the presence of cervical spondylosis or cervical osteophytes may increase the risk of VBI after cervical manipulation.[1] According to DiFabio,[33] one central feature of screening examinations is the patient's history. Hoffman et al[34] reported that 75% of patients complaining of dizziness can be diagnosed from the history and physical examination. However, DiFabio's[33] review of the literature suggests that identifying a patient at risk for VBI after manipulation cannot be performed a priori. This necessitates a test that can identify those at risk for VBI following cervical manipulation. The proponents of the VAT feel that the VAT can identify those at risk.

According to the *Guide to Physical Therapist Practice*,[35] physical therapists should use tests and measures whose reliability and validity have been documented in the peer-reviewed literature. This will allow physical therapists to gauge the certainty of their examination data and the appropriate evaluation of this data. Additionally, the physical therapist should consider the precision of the data yielded by a test or measure.[35] Haynes[4] states, "a screening test needs to be valid, or able to provide accurate detection or measurement of the factor being screened for, which is expressed in terms of sensitivity and specificity." As per the *Guide to Physical Therapist Practice*,[35] sensitivity and specificity come under predictive validity and may determine the diagnostic accuracy of a test or measure.

The psychometric properties of the VAT are the seventh factor. As stated earlier, Haynes[4] feels the most serious concern about the VAT is that it lacks sensitivity to detect abnormality. The results by Cote et al[28] provide strong supporting evidence, as they found 0% sensitivity, as well as 0% positive predictive value. Also, there are reports of false negative outcomes.[27,28] These findings would suggest that the VAT has very little, if any, diagnostic value. However, the results of some of the studies mentioned in this paper need to be carefully reviewed, as some are limited by using VA models, cadavers, or pigs. Obviously, this affects generalizations to the human population. Although the diagnostic value of the VAT is not supported by such poor psychometric properties, the *Guide to Physical Therapist Practice*[35] states that the use of measurements without established reliability and validity may be appropriate if no alternatives exist and provided that the physical therapist is aware of the measurements limitations.

Given the lack of sensitivity of the VAT, many authors have recommended the use of noninvasive Doppler velocimetry or more invasive duplex ultrasonography to examine blood flow through the VAs in patients who have a positive VAT.[4,15,16,22] Velocimetry has demonstrated a high sensitivity (85%-91%), when compared to the gold standard of angiography, in detecting stenosis greater than 60%. In the future, physical therapists may be qualified to use such imaging modalities in the examination, evaluation, and intervention of their patients complaining of dizziness.

The eight factor is the amount of force applied when performing the VAT. The force applied to the cervical spine during VAT is not close to the force imparted during cervical rotational manipulation.

Bogduk[1] and Refshauge[25] both mention that the passive gentle movement during the VAT may not give the examiner an indication of the possible risk for VBI upon vigorous, violent rotational manipulation. Alternately, cervical manipulation may still be effectively and safely performed despite a positive VAT, if a nonrotational technique is used.

Risk of injury is the ninth factor. DiFabio[33] states that the risk of injury due to cervical manipulation is not known. However, he found that the risk of complication or death from the use of nonsteroidal anti-inflammatory drugs is 100 to 400 times greater than for the use of cervical manipulation.[33] DiFabio[33] suggested that the risk for injury can be lessened if practitioners of manual therapy opted for nonthrust manipulation. To take this one step further, it would appear that nonthrust, nonrotational techniques would be the safest to use when manipulating the upper cervical spine, especially in cases when VBI is suspected. The present author has successfully treated patients with suspected cervicogenic dizziness utilizing nonthrust, nonrotational techniques without performing the VAT prior to manipulation.

It is this author's opinion, based on the above discussion, that the VAT is not clinically useful as a clinical screening tool for VBI. The most significant factor presented that formulated this opinion is the poor psychometric properties of the VAT (0% sensitivity). *The Guide to Physical Therapist Practice*[35] encourages the use of tests and measures that have demonstrated reliability and validity in peer-reviewed documents. To date, the reliability and validity of the VAT has not been demonstrated. *The Guide to Physical Therapist Practice*[35] states that the use of measurements without established reliability and validity may be appropriate if no alternatives exist. I do not believe the routine use of the VAT is appropriate, not only because of 0% sensitivity, but because of the factors discussed above that need to be considered before performing the VAT. I believe incorporating the patient's description of symptoms, past medical history, and other examination findings may be more clinically useful in detecting VBI, than one test designed to test the patency of blood blow in the collateral circulation when the VA is mechanically compromised.

CONCLUSION

The diagnostic accuracy of the VAT as a screen for VBI appears to be questionable at best. The 9 factors discussed above need to be considered in determining if the VAT has diagnostic value. In considering these factors, the present author, based on the presented evidence, concludes that the VAT is not clinically useful. If VBI is suspected, then referral to the appropriate health care provider for further diagnostic workup is recommended. In addition, nonthrust, nonrotational manipulations may be safely performed in patients with suspected VBI. In cases with a past medical history of ischemic processes the VAT should not be performed, as the evidence demonstrates that blood flow occlusion is more likely to occur with a cardiac history. With the associated performance risk of the VAT combined with an unfavorable past medical history, as well as the poor psychometric properties of the VAT, any data gathered may not outweigh the possible consequences.

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Pressure Desensitization Effects on Pressure Tolerance and Function in Patients With Complex Regional Pain Syndrome

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Experts agree that physical therapy employing a functional restoration approach is essential in the recovery of patients suffering from complex regional pain syndrome (CRPS).[1] Patients seeking physical therapy assistance for this condition most commonly find themselves in the hands of outpatient orthopaedic therapists.[1] Although increasing in prevalence, CRPS is still a relatively rare condition with a high degree of sensitivity to treatment.[1] Many orthopaedic physical therapists feel they could benefit from knowledge of more treatment tools to help the patient combat the condition without producing flare-ups of increased pain.[2]

Formerly referred to as 'reflex sympathetic dystrophy' (RSD), CRPS is an unrelenting, hyperpathic chronic pain condition of the extremities.[3] There are 3 diagnostic subcatagories to CRPS. The presentations of Type I and Type II CRPS are identical with the distinction that the Type II diagnosis requires evidence of a well-defined nerve injury, while a Type I condition follows a soft tissue injury where there is not objective evidence of neuropathic involvement.[2] There is also Type III CRPS which has the same symptom presentation as the other two categories yet, curiously, is not accompanied by pain.[4] It is thought that for Type III patients this initial painless phase may be due to peripheral nociceptive nerve compression from edema and that the appearance of pain is an eventuality. In addition to the diagnostic foundation of hyperpathic limb pain, the diagnosis of this syndrome is based on the presentation of at least 4 out of the following 6 cardinal symptoms in the affected limb(s): trophic changes including abnormal hair or nail growth, vasomotor changes indicated by skin color or temperature alterations, sudomotor changes involving increased perspiration, motor impairments which cannot be explained by mechanical or neural pathology, localized unresolving edema, and allodynia or hyperpathia.[5]

Diagnostic Signs and Symptoms of CRPS*

- Pain out of proportion in duration and intensity to the associated trauma
- Excessive perspiration in the affected extremity
- Edema (if unilateral, and other causes excluded)
- Asymmetry or instability of skin temperature or color
- Shiny skin, hair loss, or abnormal nail growth
- Impaired motor function such as tremor, weakness, motor latency, or abnormal limb posturing which cannot be explained by mechanical or neurogenic factors

*Not all symptoms need to be present and frequently are not all present. The diagnostic requirement is 4 out of 6.

Of patients affected by CRPS, 74.0% experience allodynia,[5] which is "an exquisitely hypersensitivity to light touch, such that the affected individual may guard the limb from even the most delicate tactile contact."[6]

The recommended treatment for allodynia is tactile desensitization.[7] Desensitization is "a progressive technique to gradually habituate the patient to the presence of non-noxious stimuli, which previously elicited a pain response. A sequence of materials are selected that progress from soft, light textures to extremely coarse, irritating surfaces."[2] While the term desensitization has been in use among therapists since the early 1970s, its use can be traced back to 1634 when residual limbs following amputation were treated with massage and oils.[8]

Desensitization has been used in the treatment of CRPS since at least as early as 1990 when Cheshire and Snider used capsaicin as the desensitizing agent in the treatment of a 31-year-old woman with "RSD."[9] Both Walsh and Muntzer[4] and *Bonica's Management of Pain*[2] list desensitization as a primary treatment for the hypersensitivity and allodynia associated with CRPS. The State of Washington Department of Labor and Industries now includes desensitization as a required element of treatment for physical and occupational therapists managing patients with CRPS.[1] While tactile desensitization is both recommended and used with some frequency in the literature, few studies have emerged to support its efficacy.[10]

While somatosensory desensitization frequently allows patients with CRPS to reduce light touch intolerance,[11] other tactile stimuli may still produce allodynia and restrict function.[6] A recent study was conducted using a patient with upper extremity CRPS who had successfully desensitized to light touch yet maintained severe thermal intolerance, which was significantly restricting function.[6] A thermal desensitization protocol proved effective in attenuating this patient's thermal sensitivity and notably restoring functional use of the affected hand.[6] This finding suggests that desensitization may be specific to the particular somatosensory modality addressed by treatment and may not translate into the relief of allodynia generated by other types of somatosensory stimuli. In other words, desensitization to light touch may still leave a patient with thermal, pressure, or vibratory intolerance.

PURPOSE

This study's purpose was to evaluate pressure desensitization for reducing pressure induced allodynia and related functional deficits in patients with CRPS who had no light touch intolerance yet manifested functional deficits from pressure sensitivity.

SUBJECTS

This was a single subject design involving 2 patients. Patient 1 was a 43-year-old female with a 1-year history of lower extremity Type II CRPS. She displayed no fine touch allodynia or thermal intolerance; yet, marked sensitivity to plantar pressure, limited ambulation and driving distance. Patient 2 was a 27-year-old male forklift operator with a 2-year history of upper extremity Type I CRPS. He was unable to work more than 2 hours/day due to pressure intolerance. Both patients had been active participants in prior physical therapy employing a functional restoration approach.

METHODS & MATERIALS

Treatment

During the course of this investigation, pressure desensitization was the only treatment employed. Both patients had participated in extensive prior physical therapy and had reached plateaus in pain relief and function. Each patient completed a pressure desensitization protocol involving rolling progressively harder balls using the painful skin field (Figure 1). Desensitization dosing involved a once per day protocol of 3 minutes exposure, 2 minutes rest, and a second 3-minute exposure. Patient 1 participated in a 16-week desensitization course, and patient 2 desensitized for 11 weeks. Each patient attended weekly rechecks to assess progress and advance the desensitization material. Table 1 displays the progression of materials used with each patient.

Figure 1. Pressure desensitization for patient 1.

Outcome Measures

Pressure tolerance on a simulated accelerator pedal for patient 1 (Figure 2) and a hydraulic control knob for patient 2 were estimated using modified Spark compression dynamometers. Patients were asked to self apply force onto the device to tolerance and the mean of 6 peak values (in kg of force) was recorded for each weekly session. It should be noted that actual pressure in kg/cm^2 was not assessed due to the difficulty in accurately assessing potentially changing surface contact area with the measuring device and unavailability of a pressure transduction pad. Therefore, what is referred to throughout this paper as 'pressure tolerance' should correctly be interpreted as applied force to the measuring device.

Figure 2. Simulated accelerator pedal for assessment of functional self-applied force tolerance.

Table 1. Progression of Desensitization Materials

Week	Patient 1	Patient 2
1	Tennis ball/Tennis ball	Nerf ball/Nerf ball
2	Incrediball/Tennis ball	Tennis ball/Nerf ball
3	Incrediball/Incrediball	Tennis ball/Tennis ball
4	Softball/Incrediball	Super ball/Tennis ball
5	Softball/Softball	Super ball/Super ball
6	Baseball/Softball	Baseball/Super ball
7	Baseball/Softball	Baseball/Baseball
8	Baseball/Baseball	Golf ball/Baseball
9	Croquet ball/Baseball	Golf ball/Golf ball
10	Croquet ball/Croquet ball	Forklift knob/Golf ball
11	Golf ball/Croquet ball	Forklift knob/Forklift knob
12 & 13	Golf ball/Golf ball	
14	Chinese iron ball/Golf ball	
15 & 16	Chinese iron ball/Chinese iron ball	

For patient 1 data on weekly pain medication usage was collected along with self-reports of driving tolerance and functional ambulation with observational changes in gait abnormalities. Patient 2 was assessed for pre- and postpain intensity ratings, pain medication dosages, number of hours worked per week, and upper limb function via the VALPAR 9 system. The VALPAR 9 is a physical apparatus that allows assessment of manual dexterity skills in the context of various physical agility challenges such as stooping, reaching, bending, etc. The VALPAR performance scores may be used with either disabled or nondisabled patients as a component of vocational evaluation and return to work readiness in rehabilitative settings.

Analysis

Dependent variables were assessed for mean pretreatment baseline assessed during 2 weekly sessions prior to treatment, weekly throughout treatment, and upon 3-month post-treatment follow-up. Data was graphed for empirical assessment and percent changes calculated.

RESULTS

Patient 1

Pressure tolerance

The patient with lower extremity involvement showed an increase in self-applied force on the simulated accelerator pedal from 9.2 kg initially to 28.7 kg post-treatment representing a 312% increase. This brought the affected foot to a tolerance level equal to the unaffected foot (Figure 3). Measured self-applied force of the unaffected foot indicated the extent of any learning effect to the measurement system and appeared to stabilize after the second treatment week.

Functional outcomes

Walking distance increased from 0.8 miles pretreatment to 2.7 miles postde-

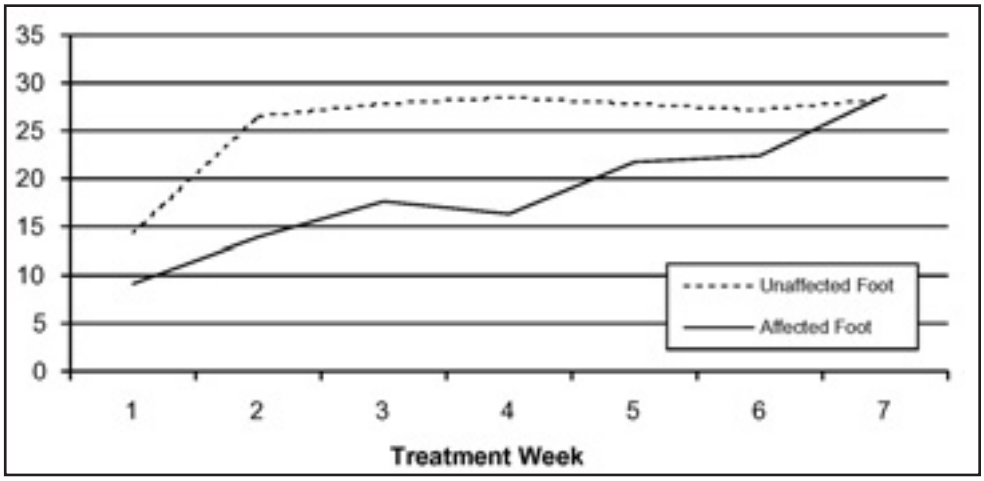

Figure 3. Self-applied force on simulated accelerator pedal for affected and unaffected foot for patient 1.

sensitization without antalgic signs. Prior to beginning treatment, the patient could not tolerate driving for more than 10 minutes due to pressure allodynia on the accelerator pedal. Following desensitization, she was able to drive in excess of 30 minutes without an increase in pain.

Pain Medication Usage

Pain medications used by this patient included a titration of Neurontin (gabapentin) supplemented by Tramadol and Ultracet (Tramadol plus acetaminophen) PRN. All medication dosages were converted to Tramadol equivalents and assessed as a weekly mean of daily dosage. Medication usage dropped from a pretreatment weekly mean (in Tramadol equivalents) of 64.0 mg/day to 23.4 mg/day postdesensitization (Figure 4). Upon 3-month follow-up, the patient was medication free. During the desensitization period, pain medication usage increased markedly. It is notable that desensitization effects on pressure tolerance and functional usage occurred even with high medication usage during treatment.

Patient 2

Pressure tolerance

The patient progressed from a pretreatment baseline mean of 11.9 kg of self-applied force using the affected hand to 21.2 kg immediately post-treatment and 22.9 kg at 3-month follow-up. The progression of self-applied force is indicated in Figure 5, representing an increase in tolerance from pretreatment to follow-up of 92%.

Functional outcomes

VALPAR 9 assessments of upper limb function were made at the beginning of each treatment session prior to desensitization. Based on the San Diego Employed Worker norms, the patient's baseline VALPAR 9 mean fell in the 15th percentile range. At the end of treatment, his performance was in the 50th percentile range. He continued to improve, scoring within the 65th percentile, at 3-month follow-up. Figure 6 illustrates changes in the total elapsed time (in seconds) to complete all 4 transfers. A decrease in elapsed time is indicative of improved functional performance.

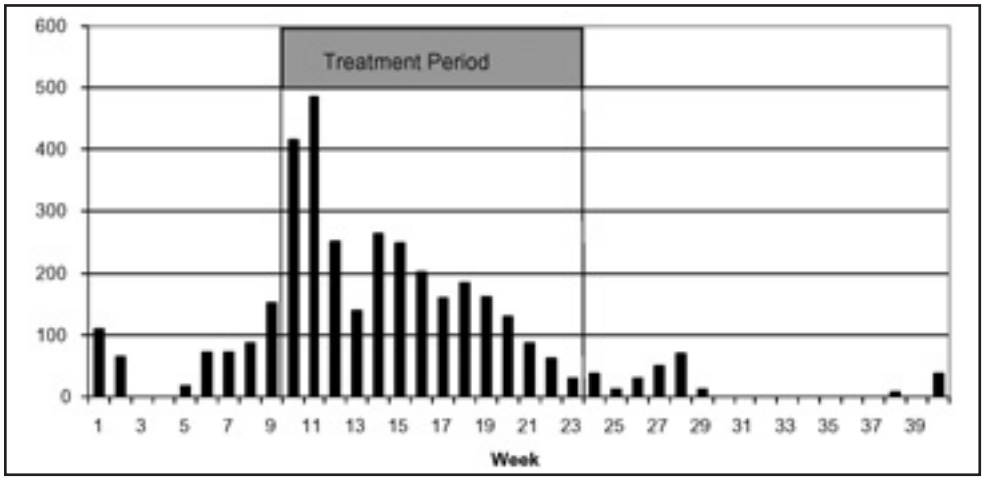

Figure 4. Pain medication usage displayed as average Tramadol equivalents per day on a week by week basis for patient 1.

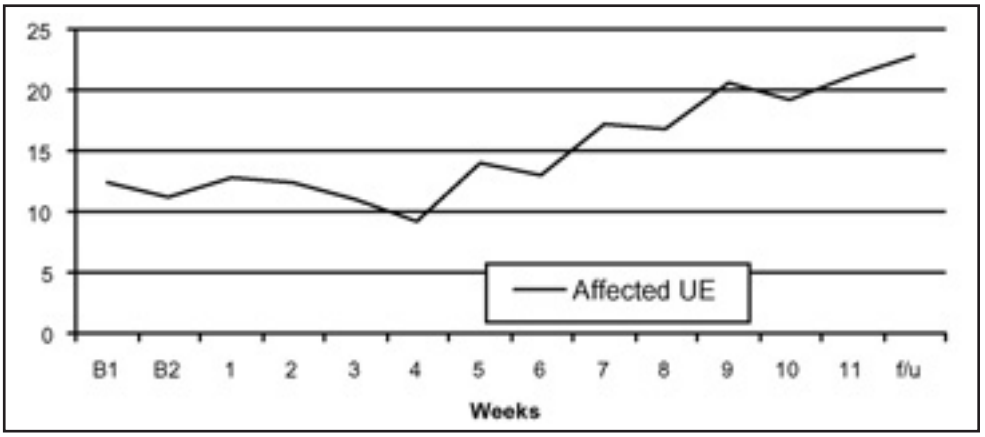

Figure 5. Pressure tolerance on simulated forklift hydraulic knob for affected upper extremity for patient 2.

At his premorbid occupation as a forklift operator, his average number of work hours tolerated increased from a pretreatment average of 1.8 hours/day to 4.7 hours/day upon 3-month follow-up.

Pain medication usage

Pain intensity ratings averaged 4/10 pretreatment with episodic flares of 8/10 and dropped to 2-3/10 post-treatment with decreased reported frequency of flares. For 7 months prior to beginning desensitization therapy, the patient had been on a consistent 3,600 mg/day maintenance dose of Neurontin. At 3-month follow-up his Neurontin dose was titrated down to 2,700 mg/day secondary to improved allodynia and decreased daily pain intensity.

A Patient's Perspective (Patient 1)

"No single treatment strategy helped me get my life back. It is difficult to isolate the value of just one aspect of treatment, but if I had to name the single best outcome of pressure desensitization, it is this: I was able to bear more pressure, which is more weight, as I walked. Midway through the research study, I realized that it no longer hurt to press on the dynamometer at the lower levels I'd done initially. I realized a similar thing was happening to pain levels while I walked. I'd been walking a treadmill for about a year when I began the pressure desensitization study so that I could return to a normal gait. I was no longer limping at the start of this study, but my goal to walk pain-free seemed impossible. During the research period, I realized the amount of time it *hurt* to walk began to lessen. The process of rolling my foot on harder, more irritating balls meant that I could tolerate more and more pressure on the sole of my foot. Months later, I continue to walk at least 2 miles each day to work, to the grocery store, to church, and around the yard as I mow the lawn. The distance I could walk pain free expanded each week."

CONCLUSION

For these patients with CRPS, pressure desensitization played a positive role in improving pressure tolerance and related functional activities.

Implications for Therapy

The findings from these 2 patients suggest that when addressing the potential factors limiting ADL function in CRPS patients, one should consider pressure intolerance in addition to tactile allodynia and diminished limb mobility. It is apparent that traditional desensitization may

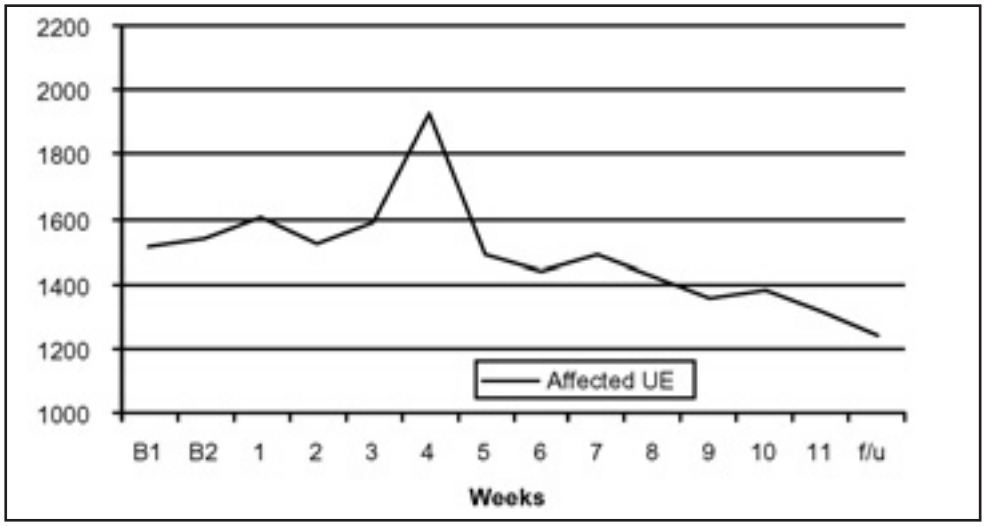

Figure 6. VALPAR 9 assessment of upperlimb function for patient 2.

successfully address tactile allodynia, while leaving pressure provocation of pain unaffected. Consistent with previous literature,[6] these findings suggest that desensitization effectiveness is specific to the particular somatosensory modality that was treated. Because CRPS potentially affects multiple somatosensory systems, it is important for the therapist to implement a desensitization protocol that addresses the particular stimuli aggravating a given patient's pain.

It is meaningful to note that the therapeutic desensitization effect occurred for patient 1 with increased pain medication usage during treatment. This finding may be interpreted in at least two ways. Representing a limitation of this study it could be the case that some of the measured improvements in patient 1 were the result of the increased medication and not the desensitization therapy. However, following completion of the treatment and upon follow-up she maintained these gains while being medication free. This may suggest a second possibility that changes in allodynia due to desensitization may occur even in the presence of increased analgesic dosages. Future patients' attempts to cope with the discomfort of desensitization therapy via increased use of PRN medication may not negate the treatment's therapeutic effectiveness.

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PLEASE NOTE

The Orthopaedic Section will destroy all election ballots from the last election within 90 days of the election results being presented at the Business Meeting at the PT 2005 Annual Conference and Exposition if no one has contested the vote.

The Effectiveness of the Pressure Biofeedback Unit in the Treatment of a Patient with Clinical Lumbar Spinal Instability: A Case Report

Robert W. Sharp, MPT, Kenneth A. Olson, PT, DHSc, OCS, FAAOMPT
Amy Maxeiner, PT, MSEd

INTRODUCTION

At least 15% of the population suffers from low back pain and 60% to 80% will report some incidence of back pain during the course of their lifetime.[1] Traditionally, studies have linked the positive effects of exercise (increased strength, endurance, decreased pain,[2] decreased disability,[3] and diminished effects of deconditioning[4]) with the effective management of chronic low back pain and improved function. However, stabilization of the local muscle system is required to prevent future strains and injury at the spinal segmental level.[5] Teaching patients to perform stabilization exercises can sometimes be difficult; therefore, it is beneficial to use a 'Stabilizer' pressure biofeedback unit such as the one developed by the Chattanooga corporation. The pressure biofeedback unit monitors the spine during stabilization exercises to give feedback concerning the appropriate neutral spine position.[6] The purpose of this paper is to discuss lumbar instability and to present a case study examining the effectiveness of the pressure biofeedback unit in the treatment of a patient with clinical lumbar instability.

THE NEUTRAL ZONE

The functional unit of motion of the spine is the spinal segment. A spinal segment is comprised of the adjacent halves of 2 vertebrae, the interposed disc, the facet joints, supporting ligaments, muscles, blood vessels, and neural structures.[7] With spinal segmental injury, Panjabi[8] describes an increased size of the 'neutral zone.' The neutral zone is the area of mid-range joint movement at the spinal segmental level where there is a minimal level of passive resistance to the movement and is theorized to have an abnormal increase in mobility with injury. The neutral zone is described by Panjabi[8] to be controlled by 3 subsystems: (1) the passive subsystem consisting of the vertebrae, intervertebral discs, zygapophyseal joints, and ligaments; (2) the active system consisting of the muscles and tendons surrounding and acting on the spinal column; and (3) the neural system comprising the nerves and central nervous system which direct and control the active system in providing dynamic stability.[8] An increase in the size of the neutral zone is believed to contribute to segmental instability and to be caused by a dysfunction of at least one of the subsystems. Panjabi[8] defines clinical instability as a significant decrease in the ability of the stability system to maintain the intervertebral neutral zone within physiological limits that results in pain and disability.

Clinical Instability

Clinically, there are a series of signs and symptoms that typically are consistent for a patient with clinical instability. The patient will often complain of pain that is either 'recurrent', 'constant,' 'catching,' 'locking,' 'giving way,' or feeling 'unstable.'[9] The patient will often complain of achy type pain when assuming fixed postures such as sitting or standing and may have a history of a traumatic injury.[10] In standing, the patient may have an area of hypertrophied tissue at or near the involved spinous process(es). Paris[10] believes this abnormal tissue is due to a hypertrophy of the multifidus in an attempt to stabilize the hypermobile segment. With active movements such as forward bending, Paris[10] believes that any uncoordinated muscle spasms or contractions present during the concentric or eccentric portions of the motion typically indicate instability due to poor neuromuscular control of the active subsystem. Upon palpation, there may be a step indicative of a spondylolisthesis, which typically denotes an unstable segment.[10] If present, the step will feel as though the involved spinal segment is resting anterior in relation to its neighboring spinal segments. In order to check for hypermobility at the palpable 'step' segment, the patient can be positioned prone over pillows. Upon further palpation, if the step is no longer present when positioned prone over pillows the segment is considered to be hypermobile.[10] Passive intervertebral motion testing (PIVM) will typically indicate excessive uncontrolled movement at the involved segment. The result of such faulty movement may be an increase in micro-trauma in the tissues around the joint that contribute to dysfunction, pain, and disability.[11] One of the most common ways of treating patients with low back pain is through stabilization exercises. Clifford et al[12] recently proposed that patient's who present with signs and symptoms of clinical instability will receive better improvements in pain and disability levels when treated with stabilization exercises than patients with low back pain who did not present with such findings.

The Local and Global Stability Systems

Pain may come and go depending on the patient's activity level with typical worsening of symptoms with over-activity or under-activity. However, dysfunction may be present and continue for long periods of time.[11] Dysfunction of the active subsystem is believed to be caused by an inability to appropriately

Table 1. Summary of Common Examination findings for Clinical Lumbar Instability

Patient History/Subjective
• Achy low back pain with prolonged sitting or standing • Pain lessened with activity and movement
Physical Exam Findings
• Lumbar hypermobility noted with passive intervertebral motion testing • Palpation of a "step" of a lumbar spinal segment in standing which disappears with lying prone over a pillow • Delayed and inadequate contractions of the transverse abdominus and lumbar multifidus muscles with active trunk and hip movements • Excessive and early contraction of "global muscles" with active trunk and hip movements

recruit the muscles of 'local stability,' which can lead to recurrence of pain and an early progression of degenerative changes.[11] By definition, the local stability system consists of the muscles which have direct attachments to the lumbar spine, especially the transverse abdominus and multifidus.[13] These muscles have been shown to be especially important in attaining segmental stiffness.[9] Other muscles included in the local system are the psoas major, quadratus lumborum, lumbar parts of the lumbar iliocostalis, longissimus, and obliquus internus.[13] By contrast to the local system, the 'global system' consists of larger torque producing muscles that produce trunk and spine movements but do not have direct attachments to the spine or trunk. These muscles are the rectus abdominus, obliquus abdominus, and the thoracic part of the iliocostalis.[13]

In research of the local stability system, Hodges and Richardson[14] determined that trunk musculature contracted prior to hip movement in individuals with no history of back pain to help provide stability to the spine. The transverse abdominus was shown to be the first muscle contracted, and the multifidus and abdominal muscles were contracted in anticipation of any reactive forces produced by lower extremity movements.[14] Although these studies were performed on healthy subjects with no history of back pain, Hodges and Richardson[15] in previous research concluded that contraction of the transverse abdominus was significantly delayed in patients with low back pain in all trunk and spine motions. This discovery showed that patients with low back pain typically present with deficient motor control of the local stability muscles, which contributes to poor active stabilization of the spine.[15]

Anatomy of Stabilizing Muscles

The transverse abdominus is the deepest of the abdominal muscles and its fibers blend into the thoracolumbar fascia laterally between the iliac crest and the twelfth rib.[6] The transverse abdominus attaches posteriorly to each lumbar vertebrae via the throracolumbar fascia. It is responsible for increasing intra-abdominal pressure and when contracted produces a 'drawing in' of the abdominal wall.[6] The lumbar multifidus is the most medial of the lumbar muscles and is particularly important because of its direct attachments to the lumbar facet joints. It has a bipennate origin and insertion. It arises just lateral and inferior to each facet joint where it passes upwards and more medial to attach to the lower third of the facet capsule above.[7] Although the multifidus is not involved in larger torque producing movements of the lumbar spine, multifidus contractions will increase segmental stiffness due to its' direct attachments to the facet joints.[5,9]

Spinal stabilizing muscles contract prior to trunk movements in people who are asymptomatic. Also, patients with chronic back pain and/or spinal segmental instability symptoms do not typically display the same type of anticipatory contraction of the stabilizing muscles.[5,15] A stabilization exercise program that focuses on activation of the local muscles with inhibition of contraction of the global muscles has been shown to be beneficial.[15] The program should begin by initiating isometric co-contraction exercises to re-educate the multifidus and transverse abdominus. After re-education is achieved, exercises may be progressed to dynamic functional movements of the trunk and limbs while sustaining co-contraction.[5] Nelson et al[16] studied 895 patients with chronic low back pain and treated each patient with specific stabilizing exercises designed to isolate and rehabilitate the lumbar multifidus and transverse abdominus. Seventy-six percent of the patients had good or excellent results, and of those, 94% reported maintaining their improvement at a 1-year follow-up.[16]

Although physical therapists are familiar with the neutral spine position and proper co-contraction necessary for re-education of the multifidus and transverse abdominus, it may be difficult to teach and train patients who have spinal dysfunctions and instability a proper technique. A study conducted by Elia et al[17] compared a group of 13 physical therapists familiar with stabilization training and 13 novice healthy individuals unfamiliar with stabilization exercises prior to their participation in the study. Each group performed the same trunk stabilization exercises. The study analyzed the amount of pelvic movement that was seen with dynamic stabilization training. The results of the study showed that the experienced group consisting of physical therapists demonstrated significantly less pelvic movement than the novice group.[17] This study is relevant because novice healthy individuals instructed in stabilization exercises may not be facilitating the ideal co-contraction necessary for retraining the local stability system.[17] Therefore, physical therapists must consider incorporation of teaching strategies in order to successfully re-educate the local stability system.[11]

The Pressure Biofeedback Unit

The 'Stabilizer' pressure biofeedback unit (Figure 1) provides feedback of proper performance of stabilizing exercises. The 'Stabilizer' registers changes in pressure in an air filled 3-chamber pressure cell, which is placed between the spine and a firm surface. The pressure cell has a tube connecting to a pressure gauge which can detect whether or not a patient can maintain a neutral spine position either isometrically or with dynamic movement.[6] The co-contraction of the transverse abdominus and the lumbar multifidus involves a 'drawing in' action of the abdominals. The pressure biofeedback unit can monitor this contraction by either an increase in pressure in the supine position contraction or a decrease in pressure in the prone position contraction.[5]

Figure 1. The Stabilizer pressure biofeedback unit.

In order to assess the level of retraining necessary, it is important to first test prone position transverse abdominus contraction using the pressure biofeedback unit.[6] The therapist should first instruct the patient to perform the contraction by drawing the abdominals 'up and in.' This motion also could be demonstrated by the therapist for further instruction. The 4-point kneeling position is an easy position to teach the contraction initially, and it is important the patient understands the contraction prior to testing its performance in the prone position. The test is performed in prone because isolated contraction of the transverse abdominus is more difficult in prone position than supine. It helps determine the degree to which retraining of the local stability system is necessary.[6] In prone, the pressure biofeedback unit is placed under the lower abdomen and inflated to 70 mmHg. If proper isolation of the transverse abdominus is present,

the pressure will reduce by 6-10 mmHg.[14,15] If there is an increase in pressure or a deviation from the normal 6-10 mmHg, this indicates a dysfunction or the presence of a substitution strategy.[5,6]

If the prone transverse abdominus test demonstrates dysfunction of the local stability system, training will need to begin at very low levels of load.[6] There is a high tendency for patients to be trained at excess levels of loads that do not allow for sufficient local muscle control and cause excessive contraction of the global spinal muscles. One advantage of the pressure biofeedback unit is it can monitor the appropriate level of loads for training and aids to prevent excess loading.[6]

In supine leg loading exercises, the pressure biofeedback unit is inflated to 40 mmHg.[6] With contraction of the transverse abdominus and multifidus, the pressure should increase 6 to 10 mmHg and the needle should remain steady during the stabilization exercises.[6] Another advantage of the pressure biofeedback unit is that it can help to minimize any substitution strategies that may be present while the patient attempts to maintain the neutral spine position. The rib cage, shoulders, and pelvis should all remain in a constant position during the setting action to minimize global muscle involvement during retraining. One substitution strategy often used is sucking in the upper abdominals by taking in and holding a breath, which can be done with minimal abdominal muscle activity. If this is present, there is often a drop in pressure of 1-2 mmHg that can sometimes be mistaken for the correct contraction. Another strategy used is an abnormal bracing of the external obliques. This can be assessed by testing the contraction in the prone position. If the substitution strategy is present, often there is not even a decrease in pressure, but rather an increase in pressure by 1-2 mmHg.[5]

Niemesto[18] used the pressure biofeedback unit in conjunction with manipulation treatment for patients with chronic back pain. Niemisto et al[18] compared a manipulation and stabilization exercise group to a physician consultation group, which consisted of patient education on posture and spinal precautions and 3 to 4 home exercises aimed at increasing spinal mobility, muscle stretch, and spinal stabilization. In the manipulation and stabilization exercise group, the pressure biofeedback unit was used initially in order to teach proper exercise performance. The neutral spine position was monitored using the pressure biofeedback unit and was progressed into more functional stabilization. Results of the study concluded that the manipulation and stabilization exercise group was more effective in reducing pain intensity and disability than the physician consultation group.[18]

O'Sullivan et al[19] also used the pressure biofeedback unit in conservative treatment of patients with radiologic diagnosis of spondylolysis or spondylolisthesis, which is a prevalent cause of lumbar instability. The control group in this study was prescribed 10 weeks of regular exercise such as walking, swimming, or machine weights. Eight of the control group patients saw additional providers to receive heat, massage, and ultrasound, and 9 of the control group patients were instructed to perform regular trunk curling exercises by their treating practitioner. The treatment group underwent 10 weeks of therapy with one session per week. The treatment intervention used was specific contraction of the local muscles with inhibition of contraction of the global muscles using the training techniques described by Richardson and Jull.[6] The pressure biofeedback unit was used to monitor and progress the stabilization exercises so that progression of the program would take place when the patient was able to demonstrate 10 contractions with 10-second holds in a controlled manner. The specific exercise group was compared to a control group that did not receive the specific stabilization exercises as part of their intervention. The results of the study showed that the specific exercise group showed statistically significant reductions in pain and functional disability levels that were maintained at a 30-month follow up. The control group on the other hand did not show significant changes in pain or disability levels upon completion of the study or the 30-month follow-up.[19]

A case report is described to illustrate the effectiveness of the pressure biofeedback unit in a patient with signs and symptoms of spinal segmental instability.

History

The patient is a 19-year-old female college student with a 10-month history of intermittent left lower lumbar pain that began 10 months prior to the initial physical therapy examination while bending over to pick up a weight in a weight training facility. The pain has intensified over the past 2 months, and she reports minimal relief from ultrasound and electrical stimulation from the University Athletic Training staff. The patient is a University sophomore and participates on the University golf team. She reports pulling her golf bag with a pull cart because carrying the golf bag intensifies the back pain. The pain is intensified with sustained postures such as sitting in class, prolonged standing, and sidelying. She reports that activity, movement, and walking help to ease her pain, and reports that shifting her weight to the right side after prolonged sitting eases the pain. She reports difficulty sleeping and rates her pain at a 7/10 causing a moderate limitation in her ability to sustain sitting and standing postures.

Examination

Structural examination reveals the appearance of a short right leg with moderate compensatory scoliosis, which is convex to the right in the lumbar spine. The patient presents with excessively pronated feet and bilateral genu varum. Her pelvic landmarks are even in sitting, and sacroiliac joint screening was negative for gapping, distraction, and Gillette's test. Lumbar active movements were 75% to 80% of expected range of motion in all movement planes with muscular shaking palpated at the lower lumbar multifidus muscles with forward bending, indicating poor control of the 'local system' of the lumbar spine. Passive intervertebral motion testing reveals a slight restriction at the left L3, L4 facets with evidence of overlying muscle guarding in this region. There also was generalized myofascial and facet joint restrictions and tightness in the left upper to mid thoracic area.There was hypermobility in the upper lumbar spine with passive intervertebral motion testing. With visual inspection of active lumbar movements, a hinge point of excessive movement was noted at the upper lumbar segments (L1,L2, L2,L3). The patient demonstrated a 95º hip flexion straight leg raise test bilaterally. Neurological screening was negative. The patient demonstrated good abdominal strength with the Kendall leg lowering test, but showed poor multifidus strength as evidenced by muscular shaking of the lumbar spine with active prone hip extension. This test also demonstrated early and excessive use of the erector spinae. The patient had a 36/100 Oswestry Low back pain questionnaire score at initial evaluation.

METHODS

The patient completed an informed consent form approved by Northern Illinois University IRB at the initial examination session.

Treatment

The patient was seen 2x/week for 6 sessions total. The pressure biofeedback

unit was used to monitor stabilization exercises such as supine marching in place (Figure 2), supine straight leg raises (Figure 3), sidelying lower extremity abduction with trunk bracing (Figures 4 and 5), and prone hip extension with the Tumble Form wedge under the abdomen in sessions 4, 5, and 6 (Figure 8). The device also was used initially for patient education regarding proper neutral spine position for all daily dynamic activities and regarding the proper level of contraction necessary to facilitate the local system while inhibiting the global system. Nonthrust joint manipulation of the left L3, L4 spinal segments and thrust manipulation of the upper/mid thoracic spine were used to help normalize active trunk movements in all planes of motion. Trunk rotation exercises were also incorporated with theraband in standing to functionally simulate a golf swing (Figure 6). Sessions 5 and 6 included more functional activities such as forward lunging and lateral lunging with abdominal bracing. The patient was educated to continue stabilization exercises with a home exercise program, and was instructed in self-mobilization of the upper/mid thoracic spine using a foam roll.

RESULTS

The patient reported significant reduction of back pain since beginning physical therapy. The patient reported that the only pain she had during the last 2 weeks of therapy was a mild discomfort during a 4-hour car ride. Overall, she reported a much-improved tolerance to prolonged sitting. The patient returned to full functional activities at school and reported good tolerance of her off-season weight lifting program. Lumbar active movements improved to 100% in all planes of movement with good neuromuscular control and no pain provocation. Trunk strength improved to 4+/5 level and demonstrated good performance of a home exercise program emphasizing lumbar stabilization. The patient's Oswestry score improved from 36 to 4 in 3 weeks. The patient was discharged from physical therapy after her sixth visit and was encouraged to continue with a home exercise program.

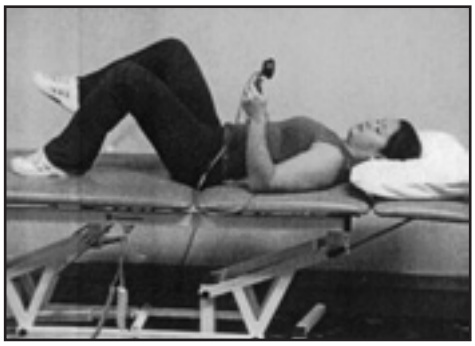

Figure 2. Supine "marching in place" with neutral spine bracing using the pressure biofeedback unit.

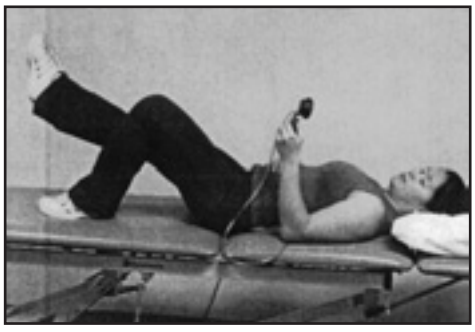

Figure 3. Supine straight leg raises with neutral spine bracing using the pressure biofeedback unit.

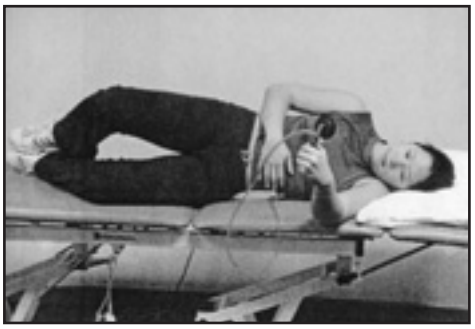

Figure 4. Sidelying lower extremity abduction with trunk bracing using pressure biofeedback unit.

Figure 5. Sidelying straight leg abduction with trunk bracing using pressure biofeedback unit.

Figure 6. Trunk rotation in standing using theraband to functionally simulate a golf swing.

DISCUSSION

Patients with signs and symptoms of clinical instability respond more favorably to stabilization exercises than patients who do not present with those findings.[12] The patient in this case presented with clinical signs and symptoms of lumbar instability that included aberrant motions, as seen with shaking of the lower lumbar multifidus muscles during forward bending and a hinging of the upper lumbar spine with active movements. The patient had a history of pain with sustained postures such as sitting in class and prolonged sitting, and she demonstrated poor neuromuscular control of the lumbar spine with active hip extension, which produced excessive contraction of the erector spinae. Such findings indicate that the patient is a good candidate for stabilization exercises.[12] The results of this case support Clifford's hypothesis that a patient presenting with clinical signs of instability would experience significant reductions in pain and disability levels with a stabilization exercise program.[12]

One of the limitations found in using the pressure biofeedback unit with patients in the prone position is that they often have symptom provocation in prone and have difficulty holding a neutral spine position in prone when performing lower extremity exercises. The patient in this case report had increased pain on the first visit when attempting to perform prone hip extension with abdominal bracing using the pressure biofeedback unit. With pillows positioned under the abdomen, typically patients are more comfortable and can attain a more neutral spine position while performing this exercise. However, the pressure biofeedback unit cannot be used with pillows placed under the abdomen because it cannot accurately detect pressure changes. We found that placing a Tumble Form wedge under the abdomen (Figure 7) offered a firm surface for the pressure biofeedback unit while

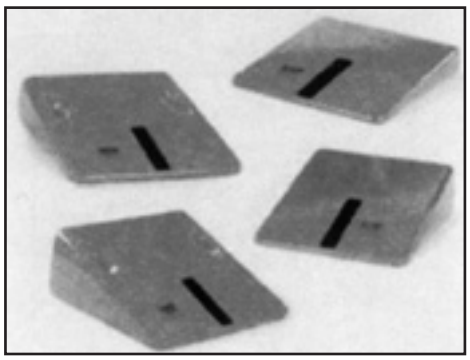

Figure 7. Tumble Forms wedges used to attain spinal flexion in prone while using the pressure biofeedback unit.

allowing the slightly flexed neutral lumbar spinal position in prone. In treatment session 4, the Tumble Form wedge was effectively introduced with the pressure biofeedback unit, and the patient reported prone hip extension as being pain free. The firm surface provided by the Tumble Form wedge allows the pressure biofeedback unit to detect more accurate changes in pressure than it would with pillows and allows symptom-free performance of the exercise.

Another limitation found in clinical practice is that exercising in the prone position requires the patient to be positioned in cervical spine rotation to read the biofeedback monitor on a normal treatment table. When the patient is uncomfortable in cervical spine rotation, we found that the patient facilitates an increased firing rate of the global muscles, namely the erector spinae. By placing the patient in the prone position on a treatment table with a face hole, the patient is able to position their cervical spine in a more neutral position allowing relaxation of the erector spinae. The problem with the face hole is that the patient cannot see the biofeedback monitor. We found that by placing a rolling stool directly under the face hole, the biofeedback monitor can be placed on the stool directly into the patient's line of sight. This accommodation, along with the Tumble Form wedge positioned under the patient's abdomen provides the best comfort and allows the most accurate facilitation of the local muscle system with stabilization exercise (Figure 8).

CONCLUSION

This case report illustrates that the pressure biofeedback unit is an effective device to teach patients the correct method of performing lumbar stabilization exercises that are designed to facilitate activation of the local system with inhibition of the global system. The advantage of using the device is that it gives feedback concerning the proper level of muscle contraction and the proper neutral spine position. Without using the device, contraction levels may exceed the levels of loads necessary to facilitate contraction of the local system and instead facilitate the already strong erector spinae (global muscles).

Since this is a case report of one patient who had a positive response to the described interventions and there was no control group, we are unable to draw conclusions on the potential effectiveness of the interventions for other similar patients. It must also be noted that multiple interventions were provided including manual therapy techniques, patient education, and exercise. The effectiveness of each individual intervention is difficult to determine based on a single case report.

Future research is needed to compare the effectiveness of using the biofeedback device to a physical therapy program when the devise is not used to teach a lumbar stabilization program in patients with clinical signs of lumbar instability.

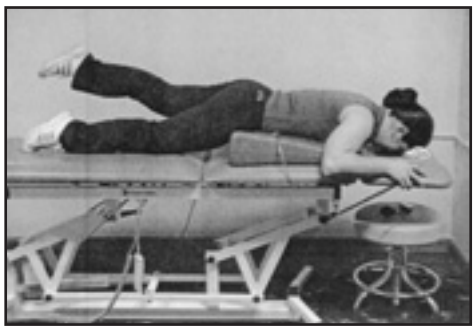

Figure 8. Prone hip extension over Tumble Forms wedge using pressure biofeedback unit on a stool viewed by the patient through a face hole.

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Manual Therapy and Neural Mobilization: Our Approach and Personal Observations

Jeffrey Alan Schroder, MPT

NEW DIRECTIONS

In the infancy of the 21st century, the profession of physical therapy is transforming towards a more autonomous practice involving advanced education, new techniques, new diagnostic criteria, and a plethora of research. The research involves all arenas of physical therapy from young to old and acute to chronic and in between. One common thread, however, is a trend and mass organizational effort towards evidence-based research.

The overall tenet of physical therapy is becoming clear with the publication and availability of *The Guide to Physical Therapist Practice.*[1] One of its many purposes is to delineate preferred practice patterns that will help physical therapists improve quality of care, enhance positive outcomes, enhance patient satisfaction, and increase efficiency and decrease unwarranted treatment approaches. An appropriate bridge from this theory to practice involves the evidence-based research paradigm. Physical therapists are best served if they combine clinical expertise with the best available external clinical evidence as a way to answer clinical questions, create more effective and efficient diagnoses, and improve upon treatment approaches.[2]

This symbiotic relationship between clinical application and external evidence is becoming more visible in clinics across the country. The clinic in which we work is no exception to this developing rule. In the early to mid 1990s, Paul Mettler, PT, owner and founder of our clinic, began to experiment with a new manual therapy technique.[3,4] Experimentation has led to refinement and some impressive clinical outcomes as documented through videotape, thermography, and SF-36 satisfaction surveys. Paul and all of us at our clinic feel it is essential and vital that more formalized outcomes are undertaken via an evidence- based approach. Through this approach, our goal is to be able to use available external evidence and clinical expertise and experiences related to this manual therapy technique to help answer some of our clinical questions and validate our outcomes scientifically.

The setting in which we practice involves many clients that have repetitive strain injuries or closely related chronic pain. More specifically, we treat many clients that have general diagnoses given by a referring physician regarding the upper extremity (ie, shoulder pain, thoracic outlet, carpal tunnel, elbow pain, forearm pain, and hand pain). Each client is evaluated as if they have no formal diagnosis in order to eliminate bias at the evaluation and allow for a more critical differential diagnosis. Often, our analysis is in line with the physician, and many times we may discover another appropriate diagnosis as an adjunct. Through our evaluation and testing procedures involving many different methods, we assign a physical therapy diagnosis to better direct our plan of care. Under this practice scrutiny, we are able to better use various treatment arsenals as a means to expedite treatment time, improve function, and improve patient satisfaction. Ultimately, we have found that regardless of the physician diagnosis, our unique ability for manual therapy guides us to the root of the problem and very high satisfaction among our clients. The question we ask ourselves with each patient is "are we making a difference?" and "how are we making that difference?" We feel we have a technique that takes us to that next level in 2 important ways. One, it has proven itself clinically; and two, we need to begin the process of strengthening this technique through the research method so we can disseminate this knowledge throughout the profession. The treatment technique that we have found to be invaluable for the upper extremity is the Mettler Release Technique® (MRT).

The research for upper extremity neurodynamic testing and treatment is growing. The research as it relates to the MRT and soft tissue restrictions is nonexistent. There are some studies that look at the pathophysiology and anatomy of the nervous system and significance as it relates to the upper extremity and rehabilitation.[5,6] The importance of understanding the neural tissue and how it functions is vital to our knowledge base. It is also important that we address the whole system in the upper extremity to include the skin and connective tissue. A literature search using Google and specifying terms such as "connective tissue mobilization" or "skin rehabilitation" leads the reader to 2 different treatment avenues. Under the "connective tissue mobilization" search, there are many sites that refer to soft tissue techniques related to massage and others related to instrumentation and tissue release. Under the "skin mobilization" search, many of the sites refer to burn care and dermatology care. Combining these 2 terms brings the reader to a more scientific search with many sites discussing connective tissue disorders and physiology related to such disorders. Consequently, much of the research today as it relates to myofascial tissue and skin has stemmed from studies looking at immobilization or direct trauma to the connective tissue at a macro and micro level. This research has led to 3 important ways that fascia can become dysfunctional and lead to painful musculoskeletal symptoms—trauma, chronic strain, and immobility.[7] The breadth of this research is small compared to muscle or nerves, but it serves as a guide for us to reach out for other contributors of pain. The MRT technique provides us an opportunity to delve deeper into the fascial and skin enigma as it relates to pain dysfunction in the upper extremity; and perhaps more importantly, a new treatment avenue.

Based on the lack of clinical and more scientific research related to fascia and the skin, we decided to come up with a simple study to answer some basic hypotheses. One, how does MRT compare to a more universally accepted treatment technique such as upper extremity neural mobilization and two, what affect does it have used in conjunction with that same technique. We chose a modification of an upper limb tension test for the median nerve as a means to objectively measure shoulder abduction range of motion. The following case study is an attempt to begin the process of 'digging' for answers and prompting more questions and research avenues. A brief overview of each technique follows with treatment approach and discussion to tie it together and hopefully create a positive thought process.

METTLER RELEASE TECHNIQUE®

Our clinic offers a strong foundation in physical therapy interventions with

the addition of a manual therapy technique in MRT. This manual therapy intervention has influenced the way our clinicians diagnose, treat and educate our clientele with multiple diagnoses. The MRT technique has provided a treatment approach with broad applications pertaining to most any region of the body secondary to its clinical effectiveness and theorized mechanism. The technique requires special emphasis addressing the multidimensional structure of the skin and underlying connective tissue to promote improved structure and function. The skin is the largest organ in the human body providing a multitude of functions ranging from protection to insulation. Underneath the 3 dermal layers lies an intricate network of connective tissue varying in physical nature and cellular components. The myofascia is a specialized connective tissue of interest at our clinic due to its connection to the muscle and more superficial structures like the skin. It is this relationship of the myofascia, muscles, nerves, skin, and other physiological processes that drives our use of MRT and makes our clinic successful.

The actual application of MRT is far from haphazard and arbitrary. The initial examination procedure involves finding the dermal-fascial restrictions in the direction in which adhesions or inappropriate collagen formation has formed. A thorough and well-established subjective evaluation will help guide the clinician to areas of investigation and possible structure involvement. This is where a good knowledge base of anatomy, physiology, mechanics, and foundational principals in physical therapy bolster the search for culpable musculoskeletal structures. Physical therapists are well versed in knowing muscle referral patterns and concomitant trigger point influence[8] as well as muscle origin, insertion, action, and innervation.[9] Once an area of interest has been identified, the use of bilateral hands, fingers, and/or thumbs are used to specifically address the mobility of the skin and underlying fascia for passive elastic properties. To enhance grip and eliminate influence of oils from our fingers, we use latex finger cots to provide the passive force necessary to eventually break up the adhesions and restore normal structural elasticity. As we assess joint mobility by assessing end-feel, we also can assess dermal-fascial mobility in the same manner grading them as a mild end-feel, hard end-feel, or block.[3]

Treatment is an extension of assessment and evaluation. Now that a directional restriction has been located, a bilateral, equal and opposite tension is applied to the dermal-fascial tissue band. The latex cots prevent slipping and sliding and allow us to gauge our intensity as well as focus our application more specifically to the tissue involved (Figure 1). We also incorporate a natural phenomenon in our body to facilitate release and improve pain perception during application. This natural entity is the craniosacral rhythm.[10] This rhythm is not used as a separate treatment application but as an important component to the MRT treatment. Very often the release of the tissue will be felt immediately; however, some of the deeper and more adhered restrictions may take 15 to 30 seconds or more to break loose.[3] The ultimate end result is a return of the viscoelastic properties of the skin and connective tissue. This translates into improved functional and objective measurements immediately post-treatment or after a short period of time. Examples of objective measures we commonly use to assess progress and related functional improvement include active range of motion, strength testing using the Microfet®, visual analog pain scales, the Cervical Range of Motion apparatus, gait analysis, and neural tension tests. Our clinic also uses body region specific questionnaires at initial and discharge to gauge functional outcomes for every client.

Figure 1. Performing The Mettler Release Technique® on the upper extremity.

THE NEURAL INFLUENCE

Adverse neural tension is an abnormal response to mechanical stimuli of neural tissue.[11] The genesis of this abnormal tissue response can be from a variety of factors to include injuries (compression, vibration, and postsurgical), intraneural, extraneural, and anatomic. A factor that receives a significant amount of attention involves that of repetitive strain injuries, specifically with the upper extremities. A condition that has received a considerable amount of visibility in the medical community and also with the common public is carpal tunnel syndrome (CTS). Clinically speaking, there are times that a patient will have completed a CTS release in hopes of relieving their painful symptoms. Many times, the pain and symptoms persist and the patient is left asking, why? One answer is that perhaps the problem was not coming from the anatomically released transverse carpal ligament, perhaps, it was coming from somewhere else more proximally. A term to describe one such explanation is the 'Double Crush Syndrome.' The problem may not be a distal inflammation or obstruction, but a more proximal problem originating anywhere from the cervical region, the shoulder, or upper extremity. This is only one of many plausible explanations; ultimately, one must consider the nervous system as a dynamic, continuous system of complex interactions that often has multiple areas of investigation and hypotheses. Upper extremity anatomy is fairly constant, but the relationship of peripheral nerve pathways, anatomical landmarks, and clinical application is tantamount to our comprehensive understanding and treatment approach with upper extremity pain and symptoms. The 3 major peripheral nerve pathways of interest are the radial, median and ulnar. Having a good overview of upper extremity anatomy will provide the practitioner tools to identify possible areas of entrapment and their clinical ramifications.[12]

A thorough understanding of anatomy is a requirement to accurate palpation procedures by the therapist. Palpation has served as an integral part of an assessment routine in discerning areas of provocation as it relates to nerve involvement. These are often performed in areas where the nerves tend to be more superficial and easily tested such as the cubital tunnel in the elbow and the carpal tunnel in the wrist. To help refine our treatment approach, we want to look at the whole picture and not just a portion. Our goal is to not just treat one area of provocation but to delve deeper into our clinical arsenal and assess the system. The system as it applies here refers to the nerves, the muscles innervated by those nerves, the myofascia, and the skin.

Neurodynamic Testing

This assessment and treatment approach allows us to physically test the dynamics and associated sensitivity of the nervous system. The basis of this testing is not entirely new with an investigation of cervical nerve root complexes gaining some increased attention back in the late seventies. Bob Elvey discovered that maximal tension placed on the cervical nerve roots, brachial plexus, and peripheral nerves involved a certain upper extremity positioning at multiple joint angles.[13]

This position has become known as a 'base test' with a median nerve bias and consists of scapular depression, shoulder abduction and external rotation, elbow extension, forearm supination and wrist/finger extension with ulnar deviation. This test has often been referred to as the equivalent to the lower extremity straight leg raise. As with many other treatment techniques and positioning approaches, other terms and insights have developed to expand on Mr. Elvey's finding. There are other such 'base tests' that are currently used in the clinic and in the research that emphasize the median nerve, ulnar nerve, and radial nerve.

Technique modification in terms of patient positioning may need to be done to evaluate each of the respective peripheral nerves. Each joint position and passive positioning by the therapist may and often needs to be adaptable to various situations (previous injuries, decreased range of motion, or other comorbidities). It is up to the therapist to interpret symptom provocation and patient response as a means to tailor the testing position and treatment approach. In the same respect, altering joint position may be used as a means to sensitize the system and lead to a possible differential diagnosis.

For our study we chose to use the upper limb tension test that emphasized the scapular component over the glenohumeral component. Our positioning and joint movement is consistent with that of Butler[11] and described later. We chose this test to eliminate multiple joint involvement and as a means to measure shoulder abduction as our variable of interest (Figure 2).

Figure 2. Modified base test as used in our study.

SUBJECTS AND PARTICIPANTS

Three subjects were chosen for this study. All 3 subjects were employed by the investigating facility as therapists and ranged in age from 25 to 34. Two of the subjects were female and one male chosen at random from a total of 7 possible participants. All 3 subjects were right handed dominant as indicated through questioning. Subjects were selected out of a sample of convenience with some basic inclusion and exclusion criteria. All subjects were informed of the intent of the study and the different treatment variables involved. Each subject provided verbal consent. No approval from an Institutional Review Board was obtained.

Inclusion criteria included full passive range of motion in bilateral upper extremities, functional strength within normal limits, normal sensation and proprioception, and ability to lie supine for an extended period of time. Exclusion criteria included pregnancy, physical therapy in the previous 3 months, and any systemic or neurological diagnosis or symptoms.

Two different physical therapists performed the 2 different treatment strategies. The therapist that performed the neural mobilization and home exercise program had 6 years experience. The therapist that performed the MRT treatment has 22 total years experience and 11 years experience with MRT, specifically. All range of motion measurement and upper extremity splinting was done by an occupational therapist with 15 years experience with much of her clinical emphasis on the upper extremity, wrist, and hand.

Treatment Setup

We chose to look at 3 different treatment approaches on the 3 different subjects. One subject received only MRT, one subject received only neural mobilization technique [referred to by Butler as upper limb tension test two (ULTT2)] and concomitant exercises, and one subject received both MRT and neural mobilization techniques and exercise. Each subject randomly and blindly drew from a hat as to which treatment technique they would receive. For each treatment technique the right arm was chosen as the investigating side and the left arm used as a control.

Each subject was placed supine on a hi-lo plinth with the arms and legs extended and uncrossed. The cervical spine was visually placed in a neutral position in the frontal and sagittal plane. Our main reference point was the right acromion and its relationship to the perpendicular straight edge of the plinth. To help standardize placement of each subject, the acromion was situated along the cephalad edge of the plinth with the use of a straight edge ruler taped to the plinth as the marker. The acromion also served as a standardization of scapular depression with neural mobilization and as a measurement control for the appropriate subjects. The neural mobilization physical therapist depressed the scapulae to the level of first resistance but not to pain in conjunction with the subjective response given by the individual's perception of resistance and/or tension. Once this point was reached, the treating therapist backed off slightly and the distance from the straight edge to the superior aspect of the acromion was measured to establish the standard distance of shoulder depression for future measurements.

Moving distally, the elbow was standardized in a maximal extended position with combined forearm supination, wrist/finger extension, ulnar deviation, and thumb abduction, and shoulder abduction via passive influence from the therapist. These joints were passively moved until the parameters of first resistance and/or tension by the therapist and subjective perception by the individual were noted. At this point, our occupational therapist splinted the wrist, hand, and fingers to establish a baseline measurement and to standardize future measurements. Each subject was fitted with a custom molded splint.

The left upper extremity was measured and positioned in the same manner as above with the exception of the wrist, hand, and finger splint. Both upper extremities for all 3 subjects had baseline range of motion measurements to include shoulder abduction, wrist extension and ulnar deviation, finger extension, and thumb abduction. All range of motion measurements were performed by an occupational therapist using anatomical landmarks common to clinical practice.[14] This therapist was blinded to treatment approach with each subject to eliminate measurement bias. Follow up measurements looked at bilateral shoulder abduction range of motion as the primary variable of interest and left upper extremity wrist extension/ulnar deviation, finger extension, and thumb abduction as secondary variables of interest. Although no splint was used for the left upper extremity, the similar end-feel and subjective procedure was used for measurement purposes. Range of motion measurements were recorded as described above after the third and sixth treatment session for all subjects.

Procedure

Neural mobilization and exercise implementation was performed by the same physical therapist for all measurements and treatment sessions. Likewise, MRT was performed by the same physical therapist for each treatment session.

Treatment sessions were performed twice per week for all 3 subjects. Treatment times were 30 minutes for MRT and 15 minutes for neural mobilization with the total duration of the treatment sessions lasting 3 weeks or 6 total visits.

Neural mobilization treatments were performed in supine and using a hi-lo plinth. The subject remains relaxed with the feet uncrossed and the uninvolved extremity at their side. The subject is slightly angled obliquely for easier access to the scapulae. The therapist position is next to the plinth facing the direction of the subject's feet. The treating therapist depressed the right scapulae of each subject with concomitant upper extremity joint positioning as per median nerve bias ULTT2 (see Figure 3). This involved elbow extension, the wrist and fingers extended and ulnarly deviated, thumb abduction and shoulder abduction. The wrist was used as the 'tension' factor during mobilization of the neural tissues secondary to the ability to use shorter amplitude of motion and for ease of oscillation. At the point where tension was felt by the therapist and perceived by the subject, grade III oscillations were performed rhythmically and slowly. A total of 20 oscillations were done at each treatment session with an increase in excursions and joint positioning attempted as the subject progressed. Concluding the first treatment session, the subject was verbally instructed on a home stretching program designed to emphasize the median nerve. The exercise given consisted of the subject in a sitting position using specific positioning of the right upper extremity in a similar fashion to the testing and treatment position. Instruction involved the subject gently elevating the ipsilateral pelvis, depressing the ipsilateral scapulae, and maintaining upper extremity positioning while performing 20 oscillations daily. Verbal instruction was validated with subject performance in the presence of the therapist to ensure proper form and enhance compliance with home program.

Figure 3. Patient and therapist presentation during treatment.

During the MRT treatment sessions, the subject was placed in the same position as when performing the neurodynamic testing and treatment. The right upper extremity was positioned at the subjects' side and treated. To assist in locations of treatment, neural tension was induced in the same manner as above with the subject stating where sensations of 'pulling, burning, aching or tension' were experienced. The areas were noted and marked temporarily as a guide to direct the therapist in finding and treating dermalfascial restrictions if present. A thorough soft tissue assessment was conducted along the areas of interest in multiple directions to localize the bands of restriction. After identifying the restrictions, the therapist applied the MRT approach until an increase in tissue elasticity was detected. This treating therapist gave no exercises or patient education during sessions.

Results

The key variable of interest for this study was shoulder abduction. The right shoulder range of motion served as our manipulated variable and the left shoulder range of motion as our control variable. Each treatment technique for all 3 subjects demonstrated an increase in right shoulder abduction at the third and sixth visits with little variation noted in the left shoulder.

After the third visit, the largest increase in shoulder motion was with subject 3 (combined MRT and neural mobilization) and the smallest increase with just MRT. After the sixth visit, the largest increase in range of motion from initial was MRT combined with neural mobilization (5º to 29º), and compared to measurements from the sixth to the third measurement, it was subject one (MRT® alone) (14º to 25º). The least amount of range of motion from initial to after the sixth treatment (10º to 19º) and from the third to the sixth treatment visit was subject one (neural mobilization alone) (17º to 19º). Initial ranges for the right upper extremity of each joint can be seen in Table 1.

We did not control for left upper extremity range of motion with splinting. After the sixth visit, we tested the range of motion of the left wrist and finger extension, wrist ulnar deviation, and thumb abduction. The ranges were within 10° for all 3 subjects with the exception of thumb abduction for subject 1 and 2.

DISCUSSION

Upper extremity symptoms and diagnoses related to repetitive strain, trauma, immobilization, or postsurgery are very common in our clinic and across the country. The 3 subjects used in this study did not demonstrate known symptoms or diagnosable conditions that limited working status or functional status. During the evaluation period and subsequent treatment times, it became apparent, however, that each subject has a component of neural tension. The classification of adverse neural tension may not have applied to these subjects; however, this study may shed some light on the possible preventative and curative capabilities of MRT® alone and in combination with neural mobilization techniques.

A well controlled study by Coppieters et al[15] looked at different test positions related to range of motion changes as well as sensory responses with neurodynamic testing. They chose the upper limb tension test one (ULTT1) with a median nerve emphasis to help answer some of their hypotheses. They discovered that compared to non-neural test positions, positioning the shoulder in a neurodynamic test position resulted in a decrease in elbow extension. Sensitizing the system even further led to greater range of motion deficits by adding contralateral cervical flexion or wrist extension or both at the same time. Their study highlighted the probability that structures (articular and muscles and their fascia)

Table 1. Shoulder Abduction Range of Motion Values Over the Course of Treatment (In Degrees)

June 10, 2002						June 21, 2002						July 2, 2002					
Subject 1 MRT®		Subject 2 Neuro		Subject 3 MRT+Neuro		Subject 1 MRT®		Subject 2 Neuro		Subject 3 MRT+Neuro		Subject 1 MRT®		Subject 2 Neuro		Subject 3 MRT+Neuro	
R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L
8º	12º	10º	12º	5º	11º	14º	10º	17º	9º	20º	12º	25º	11º	19º	8º	29º	15º

other than the neural tissue can be excluded as a cause of limitation. They also recognized that this is at least a part of the answer and acknowledged that their had been no studies that investigated the relationship of the superficial and deep layers of the myofascia in the upper limb and cervical region.

Our study demonstrated that there is a strong influence on the soft tissue and related structures in addition to the neural components. The biggest gains in ROM occurred with MRT and with the combination of MRT and neural mobilization. On the other hand, the smallest gains in ROM occurred with neural mobilization alone. In addition to addressing the nervous system and its mechanical influence, we took it a step further to address the myofascial structures. Many textbooks and journal articles have described in detail the structure of nerves, muscles, and surrounding vessels. A common component to each of these structures involves connective tissue in various forms. Intuitively, we read this information and associate a connection to painful stimuli and the effectiveness of treatment. A strong argument can be made for the connection of the skin and superficial connective tissue to the nervous system.

The whole nervous system has a network of connective tissue that mesh together from the cranial dura to the sheath surrounding the peripheral nerves. Butler[11] describes a strong but sensitive connection between the surrounding somatic tissue and the neural tissue. He also adds that adaptations are made in the neural system based on fascicular structure, depth of the nerve and connection to the somatic tissue, and "neural containers." More recent theory also has paved new inroads into the blood supply and innervations of the nerves themselves. Many feeder vessels supply the peripheral nerves with a strong circulatory effect. Prolonged strain and compression of this system can lead to physiological changes that ultimately can contribute to painful stimuli.

Similar effects can be noted in the myofascial system. It is suspect to trauma, compression, immobilization, and strain. As Schultz and Feitis[16] discuss, the myofascia exists as layers between muscles connecting deeper muscles to more superficial muscles and adjacent muscles into groups. It is a layering of sheets of fibrous tissue that flows through the body, eddying around bony protuberances that compress and redirect its flow. Fascial fibers interpenetrate the muscle, wrapping around smaller muscle fiber groups and when the muscle fibers expand and contract, they exert internal pressure on this myofascial tissue. Basic human anatomy has taught us the innervation pattern of all the major muscle groups. This means that the nerves that innervate certain muscles are susceptible to this same compression. It also leads us to believe that various nerve pathways, especially where more superficial, can become comprised by this connective tissue medium.

We feel that because of this close relationship, the MRT treatment technique used by itself or with neural mobilization, enhances the treatment approach for adverse neural tension or other upper extremity symptoms compared to neural mobilization alone. We found that right shoulder ROM improved after the third and sixth treatment session and that less sensory responses were reported by those that had had MRT treatment. No clinically relevant ROM improvements in the left shoulder abduction were noted leading us to believe that the interventions on the right were significant and not related to chance.

We also realize the limitations of this study. Based on the small sample size, it is difficult to externally validate our findings to a larger population of clients. Using only 3 subjects does not reasonably state with any certainty that with the treatment of multiple clients similar findings would be present. It is important to pursue this pilot study using a larger sample size to make greater inroads into larger data output and what significance it may have in the clinical setting.

It was our intention of this study to help lead us to more avenues of research and expound on our existing findings as well as the existing literature related to our findings. The goal is to open up the very real possibility that the skin and fascial system play a much larger role in the treatment of upper extremity pain and symptoms than has previously been studied. In the current milieu of third party payors and insurance dilemmas, it is in our profession's best interest to find treatment techniques that are more efficient and efficacious. The clinical findings in this case study suggest improved patient outcomes with the use of MRT. However, due to limitation in sample size and experimental design, more research needs to be done in this area.

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Letters to the Editor

SUBSTANCE ABUSE

To the Editor,

We would like to solicit your opinion (and that of colleagues reading this letter) on the following topic: how would you treat, or deny treatment to, a patient you suspected of being under the influence of alcohol or illegal substances?

Questioning a number of practicing clinicians on this issue during an unrelated continuing education seminar, invariably the clinicians all responded that they

(a) Should not treat a patient who is intoxicated.
(b) Would refer the patient to an institutional/clinical policy that addresses this issue.
(c) Were unable to point out any legal right to make the judgment that a person is under the influence.
(d) Were unable to state any legal right to deny treatment in such a case.
(e) Have, indeed, at times treated persons they deemed under the influence.

There are many dimensions to this issue, none of which are easy to clarify when we exclusively depend on written laws. An extensive search to find anything that might state something to the effect of "…*a physical (or occupational) therapist may deny treatment to a patient who is judged to be under the influence of alcohol or other substances*..." did not turn up this potentially career-saving dictate.

It is obvious that it could be dangerous to treat a patient whose treatment response is potentially impaired by a substance such as alcohol. This is a simple concept. All other considerations are anything but simple.

Let's start with the topic of being "…*under the influence*….". A person can legally take prescribed medications and present to the clinic impaired and unable to provide appropriate feedback to the therapist on treatment response. Therapists often treat patients who are taking medications, some of which may be narcotics. It may not be easy to judge how much of the drug the patient has taken. Some therapists caution the patient to refrain from taking the medication until after treatment, to ensure safety. Other therapists encourage the patient to take the pain medication prior to therapy, for better toleration of painful treatment.

Is there a difference in physiological response to, eg, prescribed codeine versus illegally obtained morphine? Not according to a pharmacology text.[1] Both substances are derived from opium, and both act as agonists of the μ- and κ-opioid receptors in the CNS.[1] How is the therapist to determine if the patient is under the influence of a legal versus illegal substance? And why would that make a difference in treatment (or denial of treatment), other than to encourage referral for drug counseling in case of suspected illegal drug use?

Alcohol is a little easier to deal with when deciding to deny treatment. A patient theoretically has no reason to consume alcohol prior to the clinical appointment; a therapist would never encourage a patient to "down a few shots" to better tolerate painful treatment. So it becomes a question of whether or not a person has had a drink or two, or drank half a bottle of cough syrup before coming to therapy. (By the way, cough syrup seems to be the defense of choice for suspicious breath.) Let's say that the therapist smells something suspicious on the patient's breath. How can he or she determine if the patient has been drinking? Direct questioning may or may not provide a truthful answer. A breath alcohol analyzer might do the trick, yet we were unable to find support for a therapist's legal right to administer this test. Suppose the patient admits to having had a single drink with lunch, a few hours ago. Some therapists might decide to treat a patient in such a case. Isn't that rather judgmental? Who are therapists to decide the specific level for the cut-off point for treatment? Should this be judged by overt patient behaviors? Yet people "handle their alcohol" differently. Clearly, a therapist is taking a chance when treating ANYONE that has been drinking alcohol.

There is yet another interesting twist to consider. Suppose a therapist denies treatment to a patient who comes with overt signs of using alcohol and who admits to being intoxicated. The therapist must document the missed treatment and reasons for missing treatment. Suppose that this patient is covered by Worker's Compensation. It is likely (although we were unable to find supporting documentation) that Worker's Compensation will gleefully seize upon this golden opportunity to either discontinue treatment due to non-compliance, or to deny payment for the claim altogether. Is it not our ethical responsibility to advocate for our patients? What kind of advocates would we be if we caused our patient to lose insurance coverage? On the other hand, if substance abuse were the cause of the injury sustained at work, is it ethical to cover for our patient and let society suffer the burden of a self-inflicted injury? A Gainesville online newsletter featured a Wall Street Journal article about why trauma units seldom test patients for alcohol.[2] The author cited an "…*obscure, decades-old law […] that gives insurers the option to deny medical reimbursements to patients under the influence of alcohol or narcotics*…". Perhaps this is an example of the philosophy discussed above that a person should pay for his own treatment if the injury stemmed from a deliberate action (ingestion of alcohol)…and, therefore, was his own fault.

In addition, the APTA Risk Management Resource Guide[3] noted that there is also a risk of non-payment in view of non-compliance. "…*If the therapist records that the patient is not complying with the program, the payer of services may not look upon this too kindly*…". Being denied treatment due to alcohol or narcotics use could be viewed as non-compliance. After all, it was a deliberate act on the part of the patient to consume the substance, which resulted in the missed treatment.

Another consideration is that this intoxicated person may have driven to the clinic. In Oregon, emergency staff may notify police that an intoxicated patient is about to drive (ORS 441.827).[4] It would seem that a therapist has the same legal (and ethical) responsibility. However, it is unclear how this might apply to a therapist, since for the therapist there is no way to make the determination that the patient is indeed intoxicated, according to a legal definition. Yet, how could any of us not notify the police if we saw a person lurching and swaying while climbing behind the wheel? But again, if the person admitted to being intoxicated, might notifying the police be construed as a violation of patient confidentiality? Probably not, since there is the potential of danger or injury to others: the person is a "…*clear and present danger to society*…".[4]

The therapist may have to worry about legal action after denying treatment to the patient on the basis of suspected intoxication. A person with a his-

tory of alcohol or drug abuse is considered disabled under the Americans with Disabilities Act of 1990.[5] However, people using drugs illegally are not protected under the ADA, and use of alcohol in the workplace is also prohibited.[5]

Of course, the therapist could tactfully ask the patient if he or she had taken a drink or medication or other substance before coming to the appointment, describing behaviors or other indicators that prompted the question. Whether the person confirmed or denied, he or she could subsequently be told that treatment at this time might cause injury due to impaired response, and be encouraged to reschedule the treatment session. In case the patient insisted upon treatment, a release of liability might be signed clearing the therapist and the clinic of potential charges might injury result. This is an interesting possible legal solution, but of course one that carries ethical concerns. Ziegler[6] drew a cartoon for the New Yorker Collection. It shows a group of men in suits sitting around a table with shifty eyes. The caption reads: "…*Of course what we're doing is wrong, but that doesn't make it indefensible*…".

The Occupational and Physical Therapy Codes of Ethics provide some insights. The Occupational Therapy Code of Ethics,[6] Principle 2 states: "…*Occupational therapy personnel shall take reasonable precautions to avoid imposing or inflicting harm upon the recipient of services or to his or her property*...". This principle represents the concept of "primum non nocere" believed to stem from the Hippocratic Oath, "…*I will apply dietetic measures for the benefit of the sick according to my ability and judgment; I will keep them from harm and injustice*...".[7] The American Physical Therapy Code of Ethics[8] further supports our right to exercise judgment that may prevent patient injury by temporarily withholding treatment. Principle 4 states, "…*A physical therapist shall exercise sound professional judgment*…".

This would seem to indicate that we are indeed exercising defensibly sound judgment when denying a patient treatment when we suspect that patient to be under the influence of a substance such as[1]:

- Alcohol which may cause impaired motor skills and relaxed inhibitions
- Narcotics which may cause respiratory depression and impaired pain perception
- Cannabinoids which can engender a dreamlike state
- Psychedelics which induce altered perception, hallucinations, disinhibition, and acute psychotic reactions
- Barbiturates which cause drowsiness, irritability and psychosis
- Cocaine which can result in acute CNS and cardiac toxicity

A number of courts have upheld the rule that "…*a professional who otherwise follows the applicable professional standards should not be found negligent merely because he commits an error in judgment*…".[9] So when we follow applicable professional standards (such as Codes of Ethics) and deny treatment, subsequent legal action should not result in a conviction for negligence, even if our professional judgment is found to be in error (i.e., there was insufficient evidence to prove the patient was under the influence). But will this hold true in an actual court of law?

So our original query has left us with an even greater number of unanswered questions:

- How do we define "under the influence"?
- How do we determine if a patient is indeed "under the influence"?
- Where do our ethical responsibilities lie; with the patient, or with society as represented in this case by an insurance company bearing the cost for a self-inflicted injury?
- How do we deal with a patient seemingly "under the influence" driving to and from our clinic?
- Is it ethical to attempt to cover ourselves legally if the patient insists on treatment?
- Do we violate rights under ADA when we address treatment issues with a patient afflicted with substance abuse?
- What is the legal liability to which we expose ourselves when we deny treatment for a patient seemingly "under the influence"?

It would seem that we as a profession have insufficiently addressed these issues. Addressing these issues in a facility's policy and procedure manual as apparently is being done in some facilities is not a sufficient solution. A discussion within the profession on the ethical and legal implications of these issues seems needed for a true solution: clear reference to these issues in our Codes of Ethics and (lobbying for) state or federal laws providing an answer to the questions brought up in this letter, in our opinion, would seem to be the desired outcome.

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Invited Commentary

Response to Letter to the Editor re: Substance Abuse

I have been asked to provide commentary to the ethical concerns raised in this letter to the editor regarding the obligation to treat patients whose treatment response is potentially impaired by substance abuse. This particular letter raises many issues, including ethical and

legal obligations and rights of both patients and therapists. This response will defer commentary on the legal issues (determining when patient is "under the influence," "ADA interpretation," "reporting requirements for driving motor vehicles" etc.) to legal experts, and will focus on key ethical points that may be of assistance to physical therapists.

When dealing with ethical dilemmas, physical therapists can look to the Code of Ethics and its accompanying Guide for Professional Conduct for general guidance to determine propriety of conduct. The OT Code of Ethics is very similar, and provides comparable advice.

The authors make a significant distinction between patients who are impaired from legally prescribed medications and patients who arrive in clinic intoxicated. Assuming that there are no other considerations, the therapist may use several strategies to determine if a patient can benefit from treatment, and therefore avoid the ethical dilemma of discontinuing or discharging therapy without justification. In any patient scenario, the therapist must make a clinical judgment as to whether the patient is safe to participate in program, and is able to benefit from the intervention. If any patient is deemed unsafe for any reason, and there is no obvious strategy to improve that circumstance such as using the assistance of a family member or caregiver who is legitimately involved in that patient's care, the therapist may consider discharge/discontinuation of services. Principle 4 of the APTA Code of Ethics gives support to this reasoning. This principle states that a PT must use sound professional judgment, and directs therapists not to provide PT services to a patient while his/her ability to do so safely is impaired. By approaching this situation from the standpoint of safety rather than attempting to determine legal competency related to substance abuse, the therapist would be using critical clinical judgment related to patient safety that is within acceptable professional standards.

The authors bring up several scenarios that appear to favor continuation of treatment based on the obligation to look out for the best interests of the patient. One example is the patient who is covered by Worker's Compensation. In this situation, the authors suggest that disclosing the substance abuse and documenting missed treatment would result in discontinuation of the insurance benefit. From an ethical standpoint, these types of situations are more complex. The therapist who is in this situation may need to weigh several concepts from diverse perspectives in order to come to a conclusion regarding the right course of action for the particular circumstance. Again, Codes of Ethics suggest that therapists look out for the welfare of their patients, and attempt to bring about the most good for that patient. On the individual patient level, the therapist may be weighing beneficence (do the most good), nonmaleficence (do no harm), and patient autonomy (right to self determination). The therapist's reasoning will be influenced by the therapist's own value and interpretation of the significance of "substance abuse." In this circumstance, the therapist should attempt to view the situation from the basis of knowledge of the patient's needs and perspectives. The therapist must also consider the definition of "greater good." For the patient who is a clear danger to himself/herself, the therapist may choose to discontinue therapy, and transfer care to an appropriate provider, including referral back to the referring physician. In doing so, the therapist is risking diminished trust from the patient.

On a societal level, the therapist would consider the situation from the perspective of the impact on societal resources. Reasoning for this situation would take into consideration the appropriate use of societal resources, in this case Worker's Compensation. The therapist would need to consider whether the individual is abusing the privilege of reimbursement from that source, and whether that results in misuse of limited societal resources. Here again, the Code of Ethics provides insight by directing PTs to be stewards of society's resources (Principle 7, APTA Code of Ethics.)

While the authors propose many other possible scenarios in their letter, the primary ethical concerns, as I view them, are related to the key points that I have addressed in this commentary. It is important for therapists to consider that it is always difficult to make decisions which affect patient care when patient's are suspected of being under the influence of drugs or alcohol, regardless of the specific circumstances,. From an ethics standpoint, the therapist should completely review the circumstances of each situation, and determine a course of action that is within acceptable ethical and legal guidelines, and within the scope of ethical and professional practice.

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POPTS

Michael,

I read your President's Message regarding POPTS with great interest because I am a supporter of the APTA, the state PT group, the local PT study groups and a PT at a POPTS. Being relatively new to the field (5 yrs experience), I feel that I have the advantage/disadvantage of seeing this great debate unfold with fresh insight. I work hard to keep up with any information regarding POPTS because I have read too many pointed articles from biased (both pro and con POPTS) individuals who do nothing more than make a delicate situation worse.

Your article could not be more accurate, with the exception of two issues that you brought up. I find the example of your friend working in the "utopia" of a POPTS which soon became wrought with "problems" and "major cracks" to be written in poor taste. I hear this example often and usually in a speculative sense. I have never denied that the scenario you described happens. Neither POPTS nor private practice are immune from unethical behavior. I quickly lose interest when I hear such examples in arguments against POPTS because worst-case scenarios can be brought up in favor or against both sides and they often resemble urban legends.

The other issue I question is that of your freedom being "violated" by POPTS. There can definitely be a shift in referrals when MD's have in house PT, however, a good 'ol boy system also exists between private practice PT clinics and local MDs. Many talk about the playing field not being level with POPTS in the picture. Well, the playing field has not been level since managed care showed up. I can't even begin to count the number of patients who wanted to come see me (in or outside referral) and couldn't because their insurance required them to go elsewhere.

I couldn't agree with you more when you write that, ".many physical therapists also must be released from their pecuniary and professional bondage." This should not be directed specifically at POPTS since we have lost several therapists (and have a hard time attracting them) because the hospitals and select privately owned clinics pay a lot more.

I know there is a win-win opportunity here and I hope to witness and be a part of it. Direct-access is getting that ball rolling, as is the DPT. The way I see it, we are all (or at least should be) on the same team and fighting the same battle. Unfortunately, it is turning into us (private practice) against them (POPTS). I

know some excellent PTs with outstanding credentials working in POPTS who do not belong to the APTA simply because they are ostracized by the APTA. That is a serious internal problem that needs to be fixed first and foremost.

I am aware of the potential problems that a POPTS can pose but I know that these issues are not specific to just POPTS. I can only be responsible for my own ethical behavior to ensure that I abide by the state and national PT laws. However, POPTS and unethical are synonymous in the PT realm and they should not be.

Sincerely,
David Stanley MPT, CSCS

Dear Mr Stanley:

Thank you for responding to my President's Message. You make an interesting point as to whether it is our responsibility or the physician's responsibility in making ethical decisions regarding patients. I say it is both of our responsibility to make ethical decisions for our patients. Physician Owned Physical Therapy Practices (POPTS) are not bad in a conceptual or theoretical sense in a perfect world. However, the problem lies in the inherent possibility for abuse. Avarice and greed have always been a part of the human condition, there is no mistaking that. Ethical decisions are made by humans every day; however, often these decisions can become easily obfuscated when the decision includes such a dilemma as having a job versus not having a job. Oh sure some may say ethics anytime over money, well if it's your family that really needs the money, I wonder how many would really agree with this. I believe that it is the responsibility of both physician and therapist to make ethical decisions; however, to me the existence of POPTS makes them more culpable by placing PTs in a position where they are forced into choosing survival over ethics. Moreover, I also realize that not every PT is a go getter with unlimited confidence to go it alone. Choices can be difficult.

I agree with your second comment regarding that a good old boy system can exist between PT and local MD. However, this relationship may be one based on years of trusted experience, the clinic location, the type of insurance accepted, or on kickbacks. The first are fair and reasonable reasons for referral, while the last is never acceptable. I surely hope that kickbacks are not a part of any physical therapy practice, but I would be naive to say they were not. This dishonest method of practice is an individual's irresponsibility and lack of moral ethics. I can only control my own behavior not someone else's. Hopefully PTs are not giving kickbacks to referral sources and if they are I hope that they are caught and prosecuted to the fullest extent of the law. That is also why we must get rid of the referral source once and for all. The leit motif during my Presidency (and Ben Massey's) has been Direct Access Now. Hospitals who are able to use a one service for all approach are tough to compete with; however, I believe that in the end the PT who is the best clinician will finally win this by showing superior quality of care. Although managed care has restricted the number of visits, amount reimbursed, increased co-pays, and total visits, I am still surviving by giving the highest quality of care. Word of mouth is still my best marketing tool. I know that many insurance companies do not really care about the quality of physical therapy services. This will only change when insurance companies stop seeing us as only a complimentary service. We must show insurance companies that we are more than just complimentary care and are indeed a primary care practice that is necessary for good health.

Although APTA has always been against POPTS, only recently has APTA and other Sections made a concerted effort to try and curtail their growth and existence. Considering the number of states that currently allow POPTS (over 45 states), this effort will be difficult and will require all of our help. I do know, however, that APTA is taking a much stronger stance against them and planning to make this an important part of future strategic planning. Finally, there is nothing wrong in being passionate; I just wish more PTs had your ardor.

Sincerely,
Michael T. Cibulka, PT/MHS, OCS

Update on Orthopaedic Specialty Certification (OCS)

Jean M Bryan, PT, PhD, OCS and Andrea Blake, MS

In 1999, the American Board of Physical Therapy Specialties (ABPTS) amended the policy on minimum practice requirements for eligibility to sit for all physical therapy specialist certification examinations. Minimum practice requirements are 2000 hours of direct patient care in the specialty area within the last 10 years, 25% (500) of which must have occurred within the last 3 years. Direct patient care in orthopaedics includes activities in each of the elements of patient/client management in the Guide to Physical Therapist Practice. These elements, as defined in the *Guide to Physical Therapist Practice*, are examination, evaluation, diagnosis, prognosis, and intervention. For the orthopaedic specialty certification (OCS), the previous practice requirements were a minimum of 10,000 hours of practice as a PT and 6,000 hours in orthopaedic practice. This change was initiated for the examinations in 2001. This was a trial period of 3 years during which ABPTS collected and analyzed data in order to review the results at the end of this period of time. During this trial period, ABPTS was committed to insuring the standards for the specialist certification examinations would not be affected by the change in eligibility requirements.

WHY THE CHANGE?

The ABPTS's original intent was to minimize eligibility requirements once the psychometric properties of the examinations were clearly established. By 2001, with over 20 years of exam experience, the psychometric properties had been established that the exam was able to discriminate between the specialist and non-specialist. While intuitively it might seem that more experience is better, no scientific evidence existed to support the assumption that increased years of physical therapy practice improved readiness to sit for the examination or expanded the depth or breadth of clinical experience. In addition, there are no assessment mechanisms for measuring the quality or outcomes of physical therapy practice hours—5 years of clinical experience may reflect 5 years of experience or 1 year of experience repeated 5 times.

WHAT HAPPENED IN THE LAST 3 YEARS?

No significant differences were found in exam performance between those who qualified only under the amended eligibility requirements and those who would have qualified under the previous eligibility requirements for the 2000 exam administration. Additionally, demographic data from candidates from the 2001-2003 exam administrations (N= 2019) was compared with data from candidates for the 1995-2000 exam administrations (N=2264). After careful review and analysis of the data and discussion with psychometric experts, ABPTS concluded that there was no justification for changing the current minimum eligibility requirement of 2000 hours of direct patient care in the specialty area.

WHAT CHANGED?

Approximately 90% of all candidates for the 2001-2003 specialist certification examinations reported at least 3 years of general physical therapy practice and 3 years of specialty practice when they applied to sit for the specialist certification examinations. Sixty-two percent indicated at least 6 years of general physical therapy practice; more than half (54%) reported having at least 6 years of specialty practice prior to applying for the exam. Candidates for the 2001-2003 specialist certification examinations averaged just 2 fewer years of general physical therapy and specialty practice than those who applied during 1995-2000. These candidates had a mean of 9 years of general physical therapy practice and 7.6 years of specialty practice compared with a mean of 10.6 years of general physical therapy practice and 9 years of specialty practice for candidates who applied from 1995-2000. The typical candidate during this trial period was under 40 years of age, had earned a graduate degree, and was employed in private practice or an out-patient facility as a staff physical PT, senior PT, or supervisor. This individual is early-to-mid-career, with at least 3 years of general physical therapy and 3 years of specialty practice.

There were some differences between the two groups of orthopaedic candidates. Specific to the 1,219 candidates who took the OCS exam, no one took the exam with less than 4000 hours of direct patient care in orthopaedics and only 12 candidates took the exam with between 4,000 and 5,999 hours. The mean hours for direct patient care in orthopaedics was 10, 575 (median 9,218 hours). Figure 1 shows the breakdown of direct patient care in orthopaedics for the OCS candidates. Other demographics of these OCS candidates are shown in Figure 2.

ARE YOU READY TO TAKE THE OCS EXAM?

Meeting the minimum practice eligibility requirement of 2,000 hours of direct patient care in the specialty area is only the first step to becoming a certified specialist. In fact, the concept of 'minimum' would indicate that not everyone would be ready to sit for the exam after only 2000 hours of specialty practice. This concept is certainly supported by orthopaedic physical therapists since no OCS candidates took the exam with less

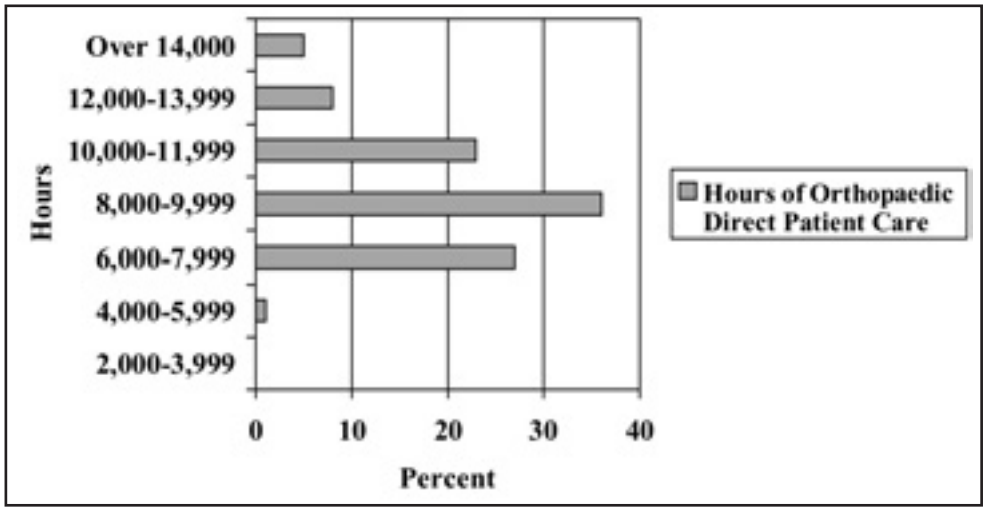

Figure 1. Hours of Direct Patient Care in Orthopaedics for 2001-2003 OCS Exam Candidates (see PPT file).

General Practice Experience	10.4 (9.0)* years
Orthopaedic Practice Experience	9.0 (8.0) years
Gender	55% Male, 45% Female
Age	50% (40-49), 40% 30-39
Job Position	(71%) Supervisor, Senior PT, or Staff PT
Employment Setting	Private Practice (52%) Outpatient (26%)

Figure 2. Demographics for OCS Exam Candidates, 2001-2003. *Mean years with median in parentheses.

than 4,000 hours and only 12 took the exam with between 4,000-5,999 hours. Because of the expense of sitting for the exam and the amount of time needed to prepare, board certification is not a professional decision to be taken lightly. Perspective candidates should take time to assess their readiness and reflect on the breadth of their clinical practice experience compared to the Orthopaedic Description of Specialty Practice (DSP). This document includes the practice, knowledge, and professional expectations for the specialty as well as sample scenarios with questions and the test blueprint. The basics of this description of practice and a test blueprint are available at no cost on line at http://www.apta.org/Education/specialist/abptscert/exam_content_outlines.The Orthopaedic DSP and its companion piece, Self Assessment Tools for Physical Therapists-Orthopaedic Physical Therapy, are helpful self-assessment tools. The orthopaedic exam content outline also includes a test blueprint by body regions which can also assist potential candidates to assess their clinical experience as compared to the exam blueprint. Following this self-assessment process, prospective candidates can decide if they are ready to take the exam and/or if they should develop a professional development plan to increase knowledge and skills in specialty area practice. The ABPTS website also has a frequently asked questions (FAQ) section which is a valuable resource to prospective candidates.

Currently there are over 3,000 board certified OCS therapists. As Diplomates of the American Board of Physical Therapy Specialties, they report an increased sense of personal achievement and pride as well as higher average incomes.[1]

[1]Technical Report, Survey of Certified Clinical Specialists, May 2004.

Book Reviews

Coordinated by Michael J. Wooden, PT, MS, OCS

O'Driscoll E, Hubbell J, eds. *Exercises For Arthritis.* New York, NY: Healthy Living Books; 2004, 198 pp., illus.

Exercises For Arthritis is a valuable handbook to be used by patients to effectively self-manage arthritic conditions. This updated resource offers simple and easy to follow programs of exercise, addressing range of motion, strength training, cardiovascular conditioning, and stretching with attention paid to joint protection principles. Developed by a registered nurse exercise physiologist and Board Certified Orthopedist, this text begins with a forward by John Hubbell, MD that recommends patient involvement in management of their arthritis as a successful long-term treatment tool. Chapters 1 through 4 address arthritis basics including a description of the many forms of arthritis and demographic statistics. The patient education information is easy to follow, well organized, and concise, specifically addressing osteoarthritis, rheumatoid arthritis, and fibromyalgia. Much of the material was reprinted from the National Institute of Arthritis and Musculoskeletal Skin Diseases' publications *Handout on Health: Osteoarthritis; Handout on Health: Rheumatoid Arthritis;* and *Questions and Answers about Fibromyalgia* as was cited in the acknowledgments.

Part II, Chapters 5 through 9 includes a discussion of posture and alignment, warming up before exercise, pacing exercise to tolerance, general guidelines for safe exercise. Tai Chi is highlighted as an effective exercise for arthritis that involves slow movements to promote flexibility, balance, coordination, and core strength development along with mental relaxation. The following pages are well illustrated and describe mobility, strength, and aerobic exercises in a step-by-step format. Walking, cycling, and water exercises are recommended by this test as effective cardiovascular training choices for arthritic individuals. The author suggests program intensity levels and progressions for these types of workouts and warns that physical over-performance or incorrect exercise technique can result in increased pain, stiffness, and joint swelling associated with arthritic conditions.

Compiling and publishing this soft cover resource text was a collaborative project only between 2 practitioners representing 3 disciplines. The Orthopedist served merely as an editorial contributor. Much of the didactic information in the text was derived directly from resources provided by the National Institute of Arthritis and Musculoskeletal and Skin Diseases. These publications were readily accessible to patients prior to 2004 when this book was published. There really is very little new knowledge presented in this book. It describes standard care that has been provided by health care practitioner through the years. This text is not unique nor did it include expertise from the Physical Therapy profession. Education and clinical skill levels specific to musculoskeletal diagnosis and management would have made a physical therapist contributor the perfect addition to this text and improved the book's stature as an educational tool for patients with arthritis.

Roberta L. Kayser, PT

Juergen M. *Imaging Strategies of the Shoulder*. New York, NY: Thieme; 2004, 168 pp., illus.

This book is a very comprehensive presentation of imaging of the shoulder. The book is organized into 10 chapters. The first chapter outlines the anatomy of the shoulder and reviews conventional radiology, conventional arthrography, sonography, computed tomography, and magnetic resonance imaging. The next 3 chapters include traumatology (fractures, infections, instabilities, and soft tissue injuries), degenerative changes (osteoarthritis and impingement), and inflammatory conditions (infectious arthritis, rheumatoid arthritis, lupus, osteomyelitis, and ankylosing spondylitis) which are the most common diagnoses seen in the clinic. The subsequent chapters include tumors, hormonal and metabolic diseases, ischemic changes (avascular necrosis), hematological diseases, neurogenic and metabolic bone diseases, and pediatric radiology.

Each chapter is organized by the definition and outline of the pathology, clinical findings, and recommended diagnostic evaluation. In the margin of each entity, goals of imaging and therapeutic principle are presented. Physical therapy is only mentioned in the margin as part of the therapeutic principles; therapy intervention is not outlined. While this would not be a reference for the clinician looking for assistance in establishing a treatment plan for patients, it is a wonderful resource for review of diagnoses of the shoulder with excellent diagrams and photographs. The clinician will gain a more thorough understanding of a patient's diagnosis.

Sylvia Mehl, PT, OCS

Section Members in the News

Congratulations to **Lola Sicard Rosenbaum of Warner Robins, GA.** Governor Sonny Perdue announced the executive appointment of Rosenbaum to the State Board of Physical Therapy.

CONGRATULATIONS!!!

A new feature to inform readers of useful resources available on the internet.

Medscape from WebMD

www.medscape.com

Medscape serves the consumer as well as specialists, primary care physicians, and other health professionals. The content is a combination of medical information and educational tools. Registration is free and users can setup their own Medscape homepage to view information you have a specific interest in. Content can be delivered to you using email alerts as well. Unique features on the site include:

- Physician Optimized MEDLINE.
- Over 250 on-line CME activities.
- Conference Coverage - thought leaders summarize key data and presentations from major medical meetings.
- The Internet's first primary-source medical journal, *Medscape General Medicine*.
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HighWire

http://highwire.stanford.edu/

HighWire Press is a division of the Stanford University Libraries and represents the largest repository of free full-text life science articles in the world of science. HighWire has partnered with scholarly societies, university press, and publishers to create a collection of searchable research and clinical literature online. More than 750,000 free, full-text articles are online. Personalized features include customizing your own site bar of favorite journals, email alerts, and PDA channels as well as a "My Folders" option gives you quick access to search strategies and articles that you have used. A "My Search Folder" allows you to retain and re-execute searches that you use frequently. A "My Article Folder," enables you to list and organize important articles, providing fast and simple access to them.

Have a website link you would like to share with our readers?

Send the link to cjh@nauticom.net

ORTHOPAEDIC SECTION, APTA, INC.
Tentative CSM Programming
February 22 - 26, 2005 • New Orleans, Louisiana

TUESDAY	February 22, 2005
8:00 AM – 5:00 PM	**Preconference Courses** **Primary Care Education Group (Day 1 of 2)** *Medical Screening for Physical Therapists* Joe Godges, PT, DPT, MA, OCS; Mary Bailey, PT, MS, OCS, CHT; Edsen Donato, PT, DPTSc, OCS, CHT; Robert DuVall, PT, MMSc, DHSc, OCS, FAAOMPT, MTC, PCC, CSCS **Pain Management Special Interest Group (Day 1 of 2)** *Functional Manual Therapy for the Upper Quarter* Alan Weismantel, PT, OMT, FAAOMPT

WEDNESDAY	February 23, 2005
8:00 AM- 5:00 PM	**Preconference Courses** **Primary Care Education Group (Day 2 of 2)** *Medical Screening for Physical Therapists* Joe Godges, PT, DPT, MA, OCS; Mary Bailey, PT, MS, OCS, CHT; Edsen Donato, PT, DPTSc, OCS, CHT; Robert DuVall, PT, MMSc, DHSc, OCS, FAAOMPT, MTC, PCC, CSCS **Pain Management Special Interest Group (Day 2 of 2)** *Functional Manual Therapy for the Upper Quarter* Alan Weismantel, PT, OMT, FAAOMPT **Foot and Ankle Special Interest Group** *Understanding the Biomechanics and Differential Diagnosis of Over-use Injuries Common to the Foot and Ankle* Justin Wernick, DPM, CPed; Debbie Nawoczenski, PT, PhD; Jill Thein-Nissenbaum MPT, SCS, ATC; Rick P. Nielsen, PT, DHSc, ECS

THURSDAY	February 24, 2005
12:30 AM-3:00 PM	**Manual Physical Therapy—Evidence and Evolution in the Management of Select Extremity Disorders** Timothy W. Flynn, PT, PhD, OCS, FAAOMPT (Moderator); Joshua Cleland, DPT, OCS; Gail Deyle, DPT, OCS, FAAOMPT; Julie M. Whitman, PT, DSc, OCS, FAAOMPT
12:00 PM-4:30 PM	**Research Platforms Session A** **Research Platforms Session B**
1:00 PM - 4:00 PM	**Management of Compressions Fractures – A Literature-based Update and Suggested Interventions** Sara M. Meeks, PT, MS, GCS
12:30 PM – 4:30PM	**Performing Arts Special Interest Group Programming** *Shoulder Pain and Injury in the Performing Artist* Teresa L. Schuemann, PT, SCS, ATC, CSCS; Glenn Williams, PT, PhD, SCS; Keith Klevan, PT; Shaw Bronner, PT, MHS, EdM, OCS; Joe Godges, PT, DPT, MA, OCS; Nicholas Quarrier, PT, MHS, OCS; Noel M. Goodstadt, PT, MPT, OCS, CSCS; Jennifer Gamboa, MPT, OCS
1:30 PM - 3:00 PM	**Calling All Authors: Evidence for Effectiveness** Christopher Hughes, PT, PhD, OCS, CSCS; Mary Ann Wilmarth, DPT, MS, OCS; Guy Simoneau, PT, PhD, ATC
3:00 PM -5:00 PM	**Occupational Health SIG Programming** *Developing and Marketing Injury Prevention Programs Based on the Evidence* Martha K. Frame, PT, MBA, OCS; Frank J. Fearon, PT, DHSc, OCS
2:30PM-3:30 PM	**Orthopaedic Certified Specialist (OCS) Exam and Description of Specialty Practice (DSP) – What's the Deal?** Richard Ritter, PT, MA
3:30PM-4:30PM	**ABPTS OCS Update** *Potential Speakers:* Rob Landel, PT, DPT, OCS; Nancy Henderson, PT, PhD, OCS; Robert Johnson, PT, MS, OCS

6:30 PM – 7:30 PM	**Performing Arts Special Interest Group Business Meeting**
7:30 PM – 8:30 PM	**Performing Arts Special Interest Group – Reception**

FRIDAY **February 25, 2005**

8:00 AM – 11:00 AM	**Differential Diagnosis, Classification-based Treatment and Surgical Management of Hip Disorders: Current Advancements that will Impact Your Practice** RobRoy Martin, PhD, PT, CSCS; Richard E. Erhard, DC, PT; Keelan R. Enseki, MS, PT, SCS
8:30 AM-10:30 AM	**Research Platforms Session**
8:30 AM-10:30 AM	**Case Study Presentations**
9:00 AM -11:00 AM	**Scapular Dyskinesis: Examination and Intervention in Patients with Upper Quarter Dysfunctions** Lori Michener, PT, PhD, ATC, SCS; Phillip W McClure, PT, PhD; Timothy L Uhl, PT, PhD, ATC
1:00 PM - 5:00 PM	**Pain Management SIG Programming** *Low Back Pain: Updated Review on Mechanisms and Treatment* Kathleen Sluka, PT, PhD; Linda VanDillen, PT, PhD; G. David Baxter, TD, BSc, DPhil, MCSP, SRP; Suzanne McDonough, PhD; Anthony Delitto, PT, PhD, FAPTA
1:00 PM - 5:00 PM	**Foot and Ankle SIG Programming** *Athletic Footwear: Another Therapeutic Modality* Tom McPoil, PhD, PT, ATC; Robert Swartz, CPed; Cheryl Maurer, PT, CPed
2:00 PM - 5:00 PM	**PTA Education Group Programming** Trudy S. Goldstein, PT, 2nd Degree Black Belt
2:00 PM - 4:00 PM	**Research Methods Roundtable** *Orthopaedic PT Research Information Exchange Center* Anthony Delitto, PT, PhD, FAPTA; G. Kelley Fitzgerald, PT, PhD, OCS; Robert S. Wainner, PT, PhD, OCS, ECS, FAAOMPT; Julie M. Fritz, PhD, PT, ATC; Michael Mueller, PT, PhD, FAPTA; Christopher Powers, PT, PhD; John Childs, PT, PhD, MBA, OCS, FAAOMPT; Sara R. Piva, PT, MS, OCS, FAAOMPT; James R. Irrgang, PT, PhD, ATC; Daniel L. Riddle, PT, PhD
3:00 PM – 5:00 PM	**Marketing Strategies for Physical Therapists** Rick Watson, PT; Amanda Andrews, MPT; Alexis Waters
5:00 PM - 6:00 PM	**Business Meetings** Foot and Ankle SIG Business Meeting Pain Management SIG Business Meeting PTA Education Group Business Meeting Manual Therapy Education Group Business Meeting
5:00 PM-6:30 PM	**Occupational Health SIG Business Meeting**

SATURDAY **February 26, 2005**

8:30 AM - 11:00 AM	**Orthopaedic Section Business Meeting**
1:00 PM - 2:30 PM	**Research Platforms Session A** **Research Platforms Session B**
1:00 PM - 4:00 PM	**Manual Therapy Education Group Programming** *Manual Physical Therapy and the Costal Cage: Relationships with and Impact on Upper Quarter Dysfunction* Timothy J. Crunk, PT, MS, OCS, CFMT
1:00 PM - 5:00 PM	**Animal Physical Therapist SIG Programming** *Animal Rehabilitation: The Future is Now* Lin McGonagle, MSPT, LVT; Patricia M. Kortekaas, PT; Teoti Anderson, CPDT
1:30 PM-4:30 PM	**Open vs. Closed Chain Exercises for the Knee: Myths, Realities, and Clinical Implications** Christopher Powers, PT, PhD; Sean Flanagan, PhD, ATC, CSCS; Terry Malone, PT, EdD, ATC, FAPTA; G. Kelley Fitzgerald, PT, PhD, OCS; Walter Jenkins, PT, DHS, ATC
2:00 PM-5:00 PM	**Primary Care Education Group Programming** *Overview of Primary Care and Autonomous Physical Therapy Practice* Robert E. DuVall, PT, DHSc, MMSc, ATC, OCS, MTC, PCC, CSCS; Edsen Donato, PT, DPTSc, BSRT, OCS, CHT; Joe Godges, PT, DPT, MA, OCS
3:00 PM - 3:30 PM	**Rose Research Platform**
5:00 PM - 6:00 PM	**Primary Care Education Group Business Meeting**
5:00 PM - 6:00 PM	**Animal Physical Therapists SIG Business Meeting**
6:30 PM - 8:00 PM	**Awards Ceremony**
8:00 PM -11:00 PM	**Black Tie & Roses Reception**

Occupational Health Physical Therapists Special Interest Group

Orthopaedic Section, APTA, Inc.

Fall 2004 Volume 16, Number 4

Occupational Health Physical Therapy – An Exciting Venue with Expanded Opportunities

Julie C. Edelson, PT, CIE, Owner
RTW Solutions, PLLC, Alexandria, VA

Do you enjoy analyzing the biomechanics of movement and determining physical job requirements? Do you prefer working with the 'whole person' rather than focusing on a specific joint in your rehabilitation plans? Would you like more flexibility in scheduling your professional responsibilities? Do you like collaborating with a variety of team members? Do you enjoy meeting new people, discussing innovative ideas, and problem solving with other medical and rehab professionals? Are you creative in facilitating the return of injured workers to a safe and productive work environment? If these questions arouse your curiosity or interest, occupational health physical therapy may provide exciting professional experiences that you may not have considered possible.

After 21 years in the physical therapy profession, my specialization in occupational health physical therapy has provided opportunities for involvement in all of these areas and more, exceeding my professional and personal goals. I had worked in acute care hospitals performing cardiac, pulmonary, and general rehab services; practiced in outpatient settings with orthopaedic and chronic pain populations; coordinated a CARF accredited occupational rehabilitation program; and facilitated a hospital-based occupational medicine program. These experiences provided excellent stepping stones to new venues in occupational health physical therapy for a career which I continue to find exciting and challenging every day.

I had the opportunity in 1989, to move into a management position to develop a 'work capacity program,' or as we now call it, an occupational rehabilitation program. After serious consideration, I decided that my interests in biomechanical and functional analysis and cardiopulmonary services, combined with the opportunity to broaden interaction with other professionals within the team that developing this program was the right move in my professional career.

In 1998, after 9 years as the clinical coordinator in this position, I took another risk and joined a national case management/vocational rehab company on a part-time, contractual basis. The new position was based out of my home which allowed me to spend more time with my new son. I was paid in a whole new manner submitting billing sheets, providing expense reports, and keeping track of mileage and travel time. I began to understand a new revenue system for injury prevention and management services recognized by insurance and other payers. I initially averaged 6 to 10 hours per week and steadily developed my skills within this new group of professional colleagues. I also enjoyed access to new insurers that now included disability carriers and employers, not just workers compensation carriers. These professional relationships provided valuable insight in understanding the case manager and payer perspectives, as well as the bigger picture of injury management from 'date of injury' to 'file closure.' I initially performed job analyses for functional full duty and modified duty positions. With my physical therapy background, I brought valuable details to the job descriptions that were previously unavailable to these clients. This additional information enabled the rehab professionals and physicians to make critical decisions to move the cases forward. Most surprising-

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ly, I discovered I was providing a service that the nurses and vocational counselors were not always equipped or interested in providing. And initially they were the professionals the payers most commonly asked for the service. Soon I was averaging 25 hours per week and was hired as an employee with pro-rated benefits. This established a formal commitment, for both my employer and me, to further integrate my professional skills into injury prevention and management initiatives the company was developing with their customers.

Over the next 3 years, I collaborated with my nonphysical therapy colleagues to problem solve and develop a variety of injury prevention and management programs. Working as a team of professionals with a variety of backgrounds, I learned first hand the challenges and expertise required for case management and better understood workers' compensation regulations. I evaluated ergonomic risks, facilitated accommodations, and completed a significant number of job analyses in a wide variety of occupational settings. One extremely rewarding project involved addressing accessibility issues for an employee returning to work in a wheelchair. Although the referral from this disability carrier initially went to a vocational counselor, the counselor more appropriately directed it to me. I brought to the table my knowledge of ADA architectural guidelines; ergonomics, paraplegic neuromuscular function and physiologic needs, and the ability to functionally problem solve and collaborate for my client's accessibility capabilities.

Each experience and new relationship provided information upon which my expertise and professional contacts continued to expand. In October 2002, therefore, I was in the position to set out on my own and start an independent occupational health physical therapy practice. This was possible due to the continued respect and support from my nurse case management and vocational rehab colleagues. In addition I had established a professional rapport with workers' compensation and disability payers who continued to request my services in case management and other assignments due to their confidence in my expertise. Now that I have an independent consulting practice, I am even more accessible to case managers, employers, payers, and even physicians. My referral network continues to grow, through referrals from current and previous customers who state they are pleased with the versatility and quality of the services I have provided. Over the past 4 years, my customers have included workers' compensation carriers, individual companies, local government municipalities, disability carriers, evaluation vendors, and Federal Occupational Health. Each customer has a slightly different need within the occupational health physical therapist's repertoire of services. For example, the workers compensation carriers focus more on functional job descriptions and case management. The individual companies request my services to develop injury prevention programs and to analyze methods to mitigate musculoskeletal job risks. The disability carriers and Federal Occupational Health focus more on ergonomics, job analyses, and establishing modifications in workstations and reasonable accommodations for maximum functional capabilities.

These alternative venues in occupational health physical therapy at a national case management/vocational counselor company and now through my own company have resulted in more professional opportunities than I had ever imagined. I have found that being open minded to possible applications of my skills in new environments has allowed me to expand my services and improve my effectiveness. In addition, situations have arisen in which insurance carriers have sought my independent provision of services over similar clinic-based occupational health physical therapy practices. For example, a workers' compensation carrier preferred me as an independent consultant to complete a functional job analysis even though the injured worker was actively enrolled in work conditioning/work hardening at a reputable clinic where this service could have been provided. Within the litigious workers' compensation arena, I am seen by the payers as an unbiased professional who has no direct ties to the medical/rehabilitation providers or to the employers.

To assist in visualization of the opportunities in occupational health physical therapy, I have developed a list of some of the projects that have been both professionally and personally rewarding.

- An injured workers' successful return to work through creative problem-solving with the employer.

I completed a job analysis for a school bus driver who fractured her left elbow and had a residual 45° extension limitation. The critical job task she was unable to perform was to engage the left hand operated parking brake. In collaboration with the employer and the bus mechanic on-site, we were able to fabricate a predominantly foot powered brake accommodation. In order to clear her use of this accommodation, I facilitated the physician paperwork and an on-the-road driving test with the state department of transportation office, as required by the federal motor carrier safety regulations. In an area where employment opportunities are slim, this bus driver was able to return to full duty with accommodation avoiding the emotional and financial costs of permanent total disability payments and the expense of an extended job search.

- Completion of job analyses for the development of rehab goals, transitional work opportunities, functional job descriptions, modified duty programs, and establishing full duty capabilities and reasonable accommodations.

At an electrical contracting company, I analyzed and clearly objectified alternative tasks, with or without accommodations, within existing positions that were available for an electrician in the event of a work injury. The employer now has functional, alternate duty job descriptions to provide treating physicians for determination of worker placement within a more consistent return to work program.

- Development and provision of individualized on-site functional capacity evaluations to determine full duty capabilities and possible accommodations.
- Provision of a physical training program for the recruits of a fire & safety department to reduce injuries, mitigate ergonomic risks, and validate correlation between training components and job duties.
- Provision of rehab case management, collaborating with the injured worker, treating physical therapists, physicians, and employers to facilitate the injured workers capability to return to preinjury function.
- Facilitation of quality medical and therapy networks for employers by educating the providers of the employers' modified and full duty demands and the availability of accommodations.
- Consultation to insurance companies' risk departments regarding injury prevention and ergonomic strategies.
- Development of a part-time physical therapy clinic within the Occupational Health Center of a large fire & rescue

department to provide injury prevention and management initiatives (See Figure 1).

Figure 1.

- Design of a custom warm-up stretching program for a metropolitan concrete construction company to reduce musculoskeletal injuries (See Figure 2).

Figure 2.

We set the stage for success by defining job-related demands, exercise needs, trainer guidelines, and the rationale of the program. Exercises emphasized musculoskeletal readiness, balance, coordination, posture, body mechanics, and general body awareness. When I returned in 2004 for a 'fine tuning,' the company reported a decrease to 13 recordable injuries in 2003 from a high of 52 in 2001. The company continues to see a very low percentage of musculoskeletal overuse injuries within the total number of recordable injuries it had documented prior to 2001 when we initiated the program.

I have experienced, first hand, limitations within the clinic-based service environment. And I have found that these venues have provided an alternative approach to better use and further expand my professional skills, my referral network, and the services I can offer as an occupational health physical therapist.

As the occupational rehab and health specialty evolves, I know many occupational health physical therapists will take advantage of the opportunities this specialty provides the therapist, the patient, the referral source, and the employer. I look forward to working with more physical therapists in devising new methods to increase our visibility and the value of our occupational health physical therapy services.

FOOT & ANKLE
SPECIAL INTEREST GROUP
ORTHOPAEDIC SECTION, APTA, INC.

PRESIDENT'S REPORT:
The Thrill of Victory... The Agony of De-Feet

After observing and contributing to this summer's Olympics in Athens with the US Beach Volleyball team as a sports medicine staff member, it became apparent that an inordinate amount of activity occurs behind the scenes. This is done in order to accomplish a successful outcome. The time, sacrifice, and energy that the athletes put into preparing for the games are unparalleled. The support staff also contributes in countless ways. Whether the result is a gold medal performance or a disappointing de-feet, coordinated teamwork is necessary.

Research concerning the foot and ankle may not always give the results that you desire. However, in order to complete the project, coordinated teamwork is required. A concept that is thought provoking challenges us and fuels the need for research. Those individuals who present stimulating concepts are our team members behind the scenes. To those who spend countless hours doing research and especially to those behind the scenes, I congratulate and thank you. You are the gold medal winners for our profession.

There are many ways of addressing the proper technique for resolving foot dysfunction. This myriad of techniques may eventually warrant research to test their efficacy. The following article is a concept that many of you may be familiar with. It is another attempt to achieve victory over the "agony of de-feet".

Steve Paulseth, PT

ORTHOTIC THERAPY TECHNIQUES FOR IMPROVING REARFOOT CONTROL

Greg Wolfe, President
Biomechanical Services Incorporated, Brea, CA

INTRODUCTION

Foot orthoses (orthotic therapy) are routinely applied in shoes of patients suffering from a wide variety of orthopaedic problems, secondary to numerous mechanical mal-alignment syndromes. They are dispensed for treatment of injuries ranging from localized foot pain to chronic conditions in the legs and trunk. Clinicians considering orthotic therapy will commonly focus on the relationship of subtalar joint alignment and function to efficiency of movement in the lower half. Of particular concern is rearfoot compensation during heel strike, loading phase, of gait. Calcaneal motion directly relates to subtalar joint motion.[1] Using orthotic therapy to redirect ground reaction forces into the calcaneus provides substantial changes to the rearfoot loading mechanism, altering loading response throughout the kinetic chain.

The author intends to describe the effectiveness of rearfoot control provided by orthotic therapy, compare and contrast two popular techniques for increasing rearfoot control and introduce a new method for combining positive cast preparation with conventional posting techniques to further enhance rearfoot control.

Weight acceptance (loading response) during walking gait is accomplished in three tenths (.03) of a second. At which time, 110% (2.5 times body weight in runners) vertical load is imparted on the heel area.[2] The resulting ground reaction force is disseminated first in the foot by heel fat pad compression and secondly by subtalar joint pronation. 'Ankle rocker' (sagittal plane) motion also adds to the change in force vector angle, although it is minimally affected by rearfoot control discussed here.

A predictable reaction up the kinetic chain, including motion about the knee (flexion with rotation), hip (adduction with rotation), pelvis (abduction with rotation) and spine (side bending with rotation), closely follows foot compensation during loading response. Altering subtalar joint compensation can initiate functional changes in foot, limb, and trunk. Rearfoot control is a frontal plane application. It has been suggested, but not adequately substantiated how controlling a component motion in one plane affects motion in the other two planes. In the experience of the author, attempts to use orthotic therapy to control rotations have been successful, although employing the modality alone is usually not sufficient. Exercises to enhance rotational stability, particularly around the pelvis, should precede orthotic therapy.

Open chain subtalar joint motion is seen and measured as displacement at the calcaneus. This is assessed by determining the amount of inversion and eversion (frontal plane motion) available on palpation.[1] More specific to gait, calcaneal motion results in subtalar joint compensation. Calcaneal motion in gait is initiated by ground reaction force.

BIOMECHANICAL DESCRIPTION

Improving Heel Pad Function

The body's first mechanism for attenuating ground reactive force is in the fat pad located beneath the calcaneus. Unlike most fat composition elsewhere in the body, the tissue in this area is similar only to the hand. The fat cells are constricted within chambers that confine engorgement secondary to metabolic processes. Repetitive compressive load further confines potential enlargement. This tissue will atrophy secondary to physiological diminution. If the ability to fully return to off weight bearing shape between steps is compromised, the area beneath the calcaneus flattens (Figure 1A). Michaud observed that patients with heel pain will often exhibit 50% reduction in the height of fat pad upon weight bearing.[3] Even though the distortion in shape is not consistent between individuals, the infracalcaneal fat pad does change from a round bulbous appearance in children to a less acute curvature in adults. This flattening affect usually increases with age, but it can be seen in younger patients as well. Heel fat pad creep or **plastic deformation** occurs as the tissue confining fat cells are **stressed** under load. This creep is accentu-

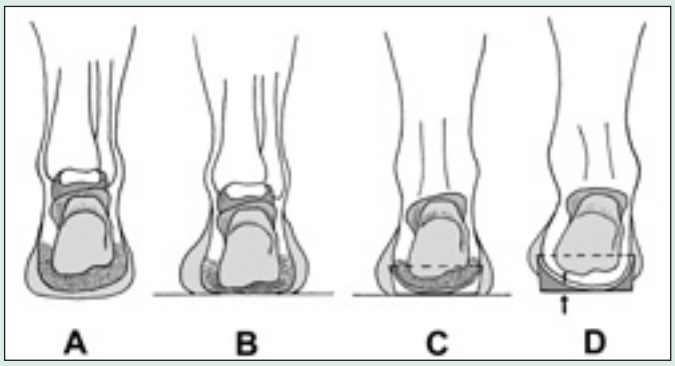

Figure 1.

ated by increases **in time spent on the feet, activity level, and body weight.**

The area beneath the heel is designed to handle compressive loads beyond what other fat pads in the body will tolerate. The cells are held in place by a web of fibrous strands arranged in a pattern of chambers that bind the cells together. Chambers closest to the bone are aligned concentrically, in a pattern that opposes a concentrically aligned reversed pattern closest to the skin.[4] These opposing patterns create a torsion affect that resists complete compression beneath a load greater in one area (under the medial condyle) than another. By confining overall volume of fat pad around the calcaneus, using a heel cup/counter, this torsion affect is expanded to resist an overall distortion in peripheral shape.[5] This increases the tissue's ability to attenuate vertical and shearing loads. Compaction of padding around the calcaneus also increases the ability to redirect ground reaction forces to one side of the bone, or the other (Figure 1B).

An accurate impression mold of the foot provides a model to which varying materials can be formed to create a compressive cup for heel area fat pad to stand on, as long as formed contours are maintained close to individual anatomical shape. A direct molded insole or orthotic shell fabricated from varying materials captures heel fat pad, supplying what is commonly referred to as a heel cup or heel seat on an orthotic device. Higher, deeper, more enveloping heel cups provide greater compression around heel fat pad, further increasing motion control and fat pad cushioning characteristics.

Improving Subtalar Joint Function

The second foot mechanism for attenuating ground reactive force during loading response is motion about the subtalar joint axis. Pronation at this joint effectively converts direct vertical force to a more horizontal vector. Redirecting the orientation of vertical force on the heel in relation to the **subtalar joint** (STJ) axis will alter the compensations that occur at this joint.

Using conventional 'posts' to angle an orthotic plate/shell in the frontal plane, ground reaction forces are redirected into the heel (Figure 1C). Rearfoot posting is a specific technique that combines the heel cup/counter effect with frontal plane angulations. This impacts calcaneal motion and subtalar joint compensation (pronation) by shifting more vertical loading force into the medial condyle of the calcaneus.

The contour under the heel is altered such that the area on the medial side is gradually elevated as compared to the lateral side. The increase in elevation imparts more vertical load on the medial side of the subtalar joint axis, resisting pronation.

INFLUENCING ORTHOTIC REACTION

Inverted Cast Technique

Until recently the primary function of a rearfoot post was thought to reduce the amount of calcaneal displacement. Successful control was measured only in terms of resisting/reducing pronation by limiting the amount of eversion. Blake et al[6] reported that this measure alone may have been suspect, as change in the amount eversion was not significantly altered with conventional rearfoot posts. Since then, other authors have reported similar findings. Withstanding such conclusions, his development of an effective technique for increasing rearfoot control provided an improved method for better controlling STJ pronation. By increasing the **angle-to-floor** orientation in the heel of a plaster foot model, the calcaneus is positioned in a more inverted alignment (Figure 2A). This increases the elevation of the medial side of the plantar heel area. The heel contact point shifts further laterally with increased inversion. It also creates a higher slope in the heel seat from medial to lateral side. It is a cumbersome process and requires an experienced technician to insure accuracy and minimize a potentially poor patient response.

The Blake Cast technique is further encumbered by its use of the plane of the forefoot as its basis for measurement and alteration. By lifting under the forefoot to invert the rearfoot, substantial plaster modifications are required to remodel the positive cast before forming an orthotic shell onto it. The arch and heel areas of the cast are reshaped with additional plaster to accommodate for changes in width of the heel and forefoot and possible plantar fascia irritation (Figure 2B).

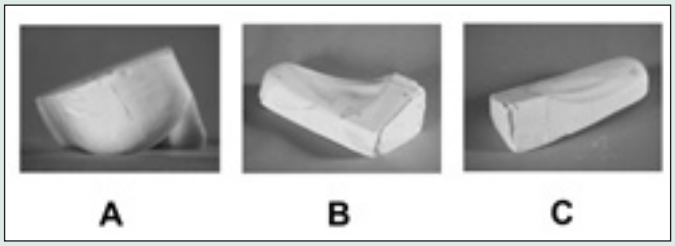

Figure 2.

Blake et al[7] described the effect of his technique as not directly related to the degree of inversion force produced. His objective was more associated with positioning of the bone. Static evaluation of the patient standing the orthotic devices, where the calcaneus was verticalor at least not in its maximally everted position was the primary determinant of successful application.

Medial Heel Skive Technique

Kirby[8] later elaborated on modifying heel shape to improve rearfoot control, a heel skive. By filing plaster to reshape the heel cup, he proposed shifting ground reactive force as the objective. He was more concerned with increasing a net supination joint moment, by delivering more force to the medial side of the subtalar joint axis. Calcaneal repositioning was a byproduct of this increased force applied medially. He suggested differentiating between ground reaction force and orthosis reactive force. This distinguishes indiscriminant force generated from the ground on a bare foot and

force applied directly to the plantar surface of a foot by an orthosis plate, as illustrated by heel cupping (See Figure 1B).

The medial heel skive technique provides superior method for sloping the heel cup (Figure 3). Plaster beneath the heel is filed away at a 15° angle off the supporting surface, and then blended to establish a slope. The angle of this slope is consistent between feet, as all casts are treated to same set angle and only the size of the area filed away changes. The forefoot plane is set on the positive cast before making alterations to the heel. Additional plaster additions around the heel are minimal, beyond standard techniques that allow for pad blooming during weight bearing. The process is easy to reproduce accurately and patient acceptance is common.

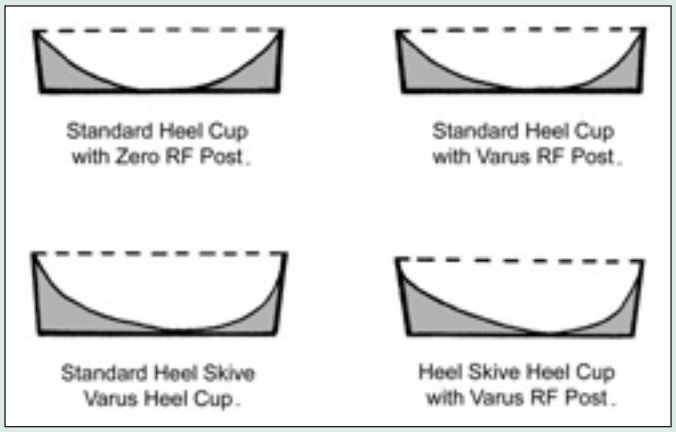

Figure 3.

Orientation of STJ axis to the long axis of the foot is a primary consideration when determining if the patient is a candidate for a heel skives.[8] Feet with subtalar joints presenting with a medially deviated orientation have less surface area to push into, medial of the joint axis. A heel skive extends the lever arm beyond what a standard cup and post can deliver. Patients with a low STJ axis orientation are also good candidates for heel skives, as their pronation joint moment is increased by inertia generated as frontal plane movement accelerates. Here a higher slope in combination with increased contact surface area medially resist the increased moment.

Criteria for successful treatment were incrementally different between authors. Blake observed the change in position of the calcaneus. Kirby also evaluated calcaneal position as a measure of success, but relies on patient feedback to determine if the joint moment was adequately reduced. Without sophisticated laboratory equipment to measure displacement or force, observation and patient feedback are the best ways to determine success for both techniques, as well as most standard orthotic therapy applications.

Expanded Approach

Rapid calcaneal eversion in gait can be observed and qualitative analysis is possible. The degree of reliability is subject to training and experience of the observer. Subtalar joint motion can be appreciated for its quality of motion. Movement of less than 5° is not discernable, even for the best-trained eye. Abrupt or excessive motions are positive findings for clinically significant motions and forces that impact the foot. Observing the affects of rearfoot motion in shoe are best made with the patient walking toward you. Despite the counter intuitiveness of this proposal, frontal plane tibial motion is the best evidence of abrupt or excessive motion about the subtalar joint, when the rearfoot is covered by a shoe. Changes in inversion and rotation motion can be observed anterior to posterior, especially focusing on the lower third of the bone.

Various formulas are available for determining rearfoot posting angles on the orthotic shell. Several of them use static angular relationships between the tibia, calcaneus, and some even take into consideration the forefoot plane angle. Posting the forefoot to control for rearfoot motion is done to reduce rearfoot compensation into and through mid-stance, in response to a forefoot mal-alignment. A rearfoot post has more direct effect than a forefoot post on subtalar motion in the frontal plane.[10] Rearfoot post control starts at heel contact and is completed before the full forefoot is in contact with the ground, before peak calcaneal eversion excursion. The orthotic shell, and any forefoot posting, offer motion control into and during mid-stance. Thereafter, only when angled crepe rubber or other flexible material is applied directly beneath the metatarsal heads does orthotic therapy offer control into and through terminal stance.

Rearfoot posting has a less than remarkable effect on calcaneal displacement as a percentage of motion, total excursion. A more important objective for rearfoot posting is change in work at the subtalar joint during loading response. Williams and colleagues[9] recently reported the most significant effect from inverted orthoses (Blake) was a reduction of negative work in the frontal plane, in runners. Also reported was a systematic decrease in inversion moment. These findings change the objectives for rearfoot posting. They also reduce the importance of exclusively measuring static angular relationships in the off weight bearing lower extremity to predict beneficial affects of rearfoot posting.

COMPONENT SELECTION

Improving Rearfoot Control

Feet exhibiting low or medially deviated subtalar joint axis are candidates for heels skives, as are feet that display abrupt calcaneal motion. Standard heel skiving is usually limited to a predetermined angle that is not associated with any selection of posting affect in degrees. Standard rearfoot posting has also shown a capability to reduce STJ frontal plane negative force and decrease the inversion moment, albeit less effectively than the inverted technique. Combining the two techniques offers clinicians the additional advantage of intrinsically altered shape of the heel cup to redirect vertical force and the added benefits of greater fat pad compression that are superior in the standard rearfoot posting technique (Figure 4A). Selecting a 5° or 10° skive angle, instead of the standard 15° angle, lowers the slope but allows for greater medial side fat pad compression (Figure 4B). A higher skive slope angle reduces the cupping depth along the medial aspect of the heel seat. It is not unusual to increase heel seat depth to maintain a higher skive slope within the cupping. Lower skive slopes allow for lower heel seat depths, which easily fit into more shoe choices. The slope can then be increased by angling the material extrinsic to the cupping and return the slope to a high pitch (Figure 4C).

Clinical Application

The author has found a 5° degree skive slope to have an effect similar to 2° of standard rearfoot posting angle. A serial progression ratio has also been used to determine rearfoot

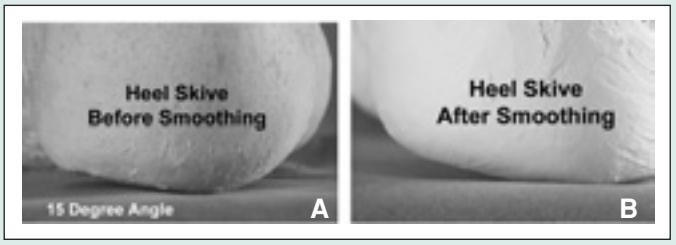

Figure 4.

posting angles, wherein 10° of skive slope angle is equal to 4° of standard posting angle and a 15° skive slope to a 6° standard angle. Higher skive slope angles have been attempted. Heel seat depths of 22mm and 25mm will accommodate slope angles of 20° and 25° respectively, although they are not recommended unless the clinician has time to pursue a protracted break-in schedule with their patient.

Patients generally find lower slope angles easier to tolerate, especially older patients with diminished fat pad. Heel spurs with acute tenderness on palpation, recalcitrant posterior plantar fasciitis, and inferior calcaneal bursitis are contraindications for heel skives or sloping.

Standard heel skives have been widely available from orthotic laboratories for over 10 years, with routine success. A 0° extrinsic rearfoot post is most commonly applied around the heel cup. Different slope angles are not as regularly available. The technique for applying alternative slope angles is easy to adjust for when preparing a positive cast since it only requires the technician to change one measuring step in fabrication.

Difficulty arises in application only because of the many variables in choosing angles for slope and posting, then considering joint axis alignment and force anomalies. Mal-alignments above the foot are additional considerations that create excessive excursions and abrupt rearfoot compensations during loading response. These many considerations can be distilled down to 3 basic rearfoot posting strategies, minimal angles, moderate angles, and maximum angles. Since the combination slope and post are added together, determining which one to increase over the other is more of a question of how much heel cupping affect is preferred. So, slope is the first determinant. Patients exhibiting more abrupt motion or larger excursion should get a higher slope angle. As discussed, this is usually secondary to low or medially deviated STJ axis of orientation.

Minimum angles range from 0° to 2° and are applied to patients presenting with <5° of open chain calcaneal eversion, high and laterally deviated STJ axis of orientation where lateral instability is a concern. Anyone who has developed a gait pattern with Active Restricted Pronation does not exhibit heel eversion on contact. Zero degree posts are indicate in cases of ARP, or even valgus rearfoot posts, which is beyond the scope of this article because of the need for long term patient management and neuro-motor considerations.

Moderate angles range from 3° to 5° and are applied to patients presenting with classic increased total excursion beyond the 4° to 6° of acceptable motion needed for efficient shock attenuation. In the presence of a deviated STJ axis sloping is a consideration, especially if abrupt motion is occurring in loading response. Subtalar joint varus is a common cause for excessive excursion but limb and trunk deviations will also create the need for increased STJ compensation.

Maximum angles range from 6° to 10° and are applied to patients presenting with gross calcaneal mal-alignment (beyond 6° everted) in static stance or total excursion ROM exceeding 12°, especially in the presence of a deviated STJ axis. If excessive total excursion and abrupt displacement is present, posting angles between 8° to 10° are indicated.

SUMMARY

Orthotic therapy is application of discrete orthotic reaction forces. Rearfoot control is but one component. It combines fat compression around the heel and shifting vertical load to the medial side of the calcaneus. Aggressive varus angles (sloped up to the medial side) beneath the heel have proven to resist excessive pronation during contact phase by increasing negative work at the subtalar joint. Improved rearfoot control also reduces stresses in long muscles and tendons entering the foot, diminishing their abrupt response to pronation by limiting amplitude and duration of eccentric contractions during initial loading phase. New control factors described here have expanded orthotic device options to include combining heel sloping and conventional posting control. This increases the number of conditions where rearfoot control has application.

Historically, athletes and children have been the patients of choice when considering aggressive heel sloping control but a wider array of patients could benefit from more subtle intervention. Seemingly mild mechanical mal-alignment syndromes like deviated subtalar joint axes are often exasperated by activities of daily living. If someone gains weight, is compelled to be active while rehabilitating a lower limb or back injury or gets older (preferred alternative), the repetition of walking will create a new set of stresses and strains beyond what the body can handle efficiently. Then rearfoot control is indicated and expanded techniques offer additional benefits for orthotic therapy.

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Performing Arts Special Interest Group • Orthopaedic Section, APTA

2004 PASIG REPORT

By: Julie O'Connell, PT, ATC

PRESIDENT'S MESSAGE

Hello everyone! It's hard to believe that it's autumn already and that we are heading quickly towards another holiday season. As for me (my family and I live in Florida), I am particularly happy to see this hurricane season finally come to an end. Hopefully, all of the season's weather did not find any of you in harm's way.

Your PASIG Board has been meeting more regularly than in the past and has been working on a modified format for the PASIG programming at the 2005 CSM. 'Evidence-based practice' is a key phrase that we are incorporating into our daily clinical lives and our programming. Ultimately, we must all try to base our clinical decisions on solid research or evidence. Our Description of Advanced Clinical Practice has aided in more clearly defining where our educational efforts need to be focused and this, combined with evidence-based practice, makes for programming that is timely, relevant, and applicable in direct patient care. Tara Jo Manal, our Vice President, has worked diligently to pull together an exciting new program that will thoroughly focus on a treatment paradigm in the care of the performing artist. I am confident that you will find this change in our educational component refreshing. Our Treasurer, Adrienne McAuley, has been working to develop guidelines for the student scholarship suggestion that was generated at CSM 2004 in Nashville. She will have more to say on this when we meet in New Orleans in February 2005. Julie O'Connell, our Secretary, has been busy traveling to Greece with the Olympics and the gold-medal winning United States Women's Soccer team. Shaw Bronner, our Nominating Chair, has put together a winning slate of candidates for this year's election. The positions of President, Treasurer, and Nominating Committee member are up for re-election for 2005. Make sure that your voice is heard by casting your vote.

Actor's Equity continues to work with several members of the PASIG to come up with measures for injury prevention and methods for injury surveillance and management. Some of our recommendations have been accepted into at least one of their contracts as of this message. If you are part of the Actor's Equity Task Force, you should be receiving updates from me as this area develops. If you are interested and have not been receiving information related to our current status with this group, please contact me directly at jsptocs@hotmail.com or by phone at 305.595.9425.

The PASIG continues to experience slow growth and we look forward to an exciting 2005. We are excited about the educational resources and valuable contacts that we can offer clinicians. Mentor a colleague interested in the arts; offer to speak to a performing arts group on injury prevention; engage an artist in discussion of performance enhancement ideas through physical therapy—these are many ways in which you could begin sharing your skills and interest in this area. Certainly, plan on joining us to vote for your new leadership of this special interest group at CSM 2005. As always, I hope you continue to be inspired and enjoy your work as physical therapists in the arts. I look forward to seeing many of you in New Orleans.

Take care,
Jeffrey T. Stenback, PT, OCS
President, PASIG

EDUCATION COMMITTEE REPORT

Please join the PASIG at CSM 05 in New Orleans. We have an exciting program planned that is the fusion of performing arts and evidence-based practice in: Evaluation and Management of a Shoulder Injury in Performing Artists—the continuum from emergency backstage care to return to their artistic activity.

This course will provide the learner with special considerations for examination and treatment of the shoulder complex in the performing artist. It will include emergency back stage care of the shoulder injury, examination techniques to differentiate between shoulder and cervical dysfunctions, special considerations of the ergonomic evaluation of the performing artist (ie, costuming), injury risk screening, and rehabilitation of the performing artist with a shoulder injury. There will be discussion of cases at the end of the presentation.

Thursday February 24, 2005 Combined Sections Meeting in New Orleans, Louisiana

12:30-1:00 pm	Emergency Back Stage Care of a Shoulder Injury in a Performing Artist **Teresa L. Schuemann, PT, SCS**
1:00-2:00	Differential Diagnosis Shoulder vs. Cervical Injury in a Performing Artist **Glenn Williams, PT, PhD, SCS**
2:00-3:00	Rehabilitation of the Performing Artist with a Shoulder Injury **Joe Godges, DPT, MA**

3:00-3:30	Special Ergonomic Considerations of the Performing Artist with a Shoulder Injury **Keith Kleven, PT**
3:30-3:45	Screening for the Identification of Shoulders at Risk of Injury **Shaw Bronner, PT, MHS, EdM, OCS**
3:45-4:30	Case Presentations of Performing Artists with Shoulder Injuries **Noel M Goodstadt, PT, MPT, OCS, CSCS** **Jason Grandeo, MPT, ME, ATC** **D.S. Blaise Williams III, MPT, PhD**

Business Meeting and Reception will follow the scheduled programming.

Please look for the location in the on-site program; we hope to see you there.

MEMBERSHIP COMMITTEE REPORT

The PASIG Membership Directory was completed and is available by contacting the Orthopaedic Section at www.orthopt.org. There have been some reported difficulties accessing the membership section of the website. The Orthopaedic Section is aware of this. Please contact me for all new memberships and continue to send all updated information to me, Susan Clinton PT, MHS at sclint@lsuhsc.edu or to Tara Fredrickson at the Orthopaedic Section office, tfred@orthopt.org.

Susan Clinton, PT, MHS
Membership Chair

NOMINATING COMMITTEE REPORT

By now, you have received the ballots with PASIG candidate statements. We have an excellent slate of candidates. Our committee thanks each of your for your willingness to serve. We hope each PASIG member has returned her or his vote, demonstrating your support of our organization.

As a physical therapist practitioner, you give generously to your patients. We ask you to reflect on how much you receive in return from those same patients. All of the organizations: the APTA, Sections, SIGs, and state chapters exist because of the generous donation of time from each volunteer. Each volunteer also receives much in return, through networking, new friendships, and learning experiences. With this in mind, we urge you to consider running for PASIG office. Please contact us!

See you at CSM,
Shaw Bronner PT, MHS, EdM, OCS
Nominating Committee Chair (Outgoing)

Gayanne Grossman PT
Nominating Committee Chair (Incoming)

Karen Hamill PT
Nominating Committee Member

RESEARCH COMMITTEE REPORT

The Research Committee is presently involved with a research study to evaluate the effects of iontophoresis with lidocaine for musicians with lateral epicondylitis. They are involved with planning and participating in a seminar at Julliard Music School in NYC to help keep musicians from getting injured. They are available to assist all other committees, if necessary. They continue to be available for interaction and communication with all therapists who have an interest in performing arts physical therapy.

Lisa Sattler, PT, MS
Research Committee Chair

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For a complete listing of our officers please visit our website.

Pain MANAGEMENT

SPECIAL INTEREST GROUP • ORTHOPAEDIC SECTION, APTA, INC.

PRESIDENT'S MESSAGE

Joe Kleinkort, PT, MA, PhD, CIE

I have just returned from taking my boards and meeting many pain management practitioners at the American Academy of Pain. I was surprised to note that less than 1% of the members are physical therapists. The percentage of members in our SIG is far higher in the Orthopaedic Section. I want to thank each of you for supporting and coming together to share and grow in our cumulative approach to pain management. The challenge both physically, mentally, and spiritually is great with every patient. The rewards are often subtle and not obvious. But it is each of you not giving up, staying the course, and learning new and different techniques that touch each patient's life in a variety of ways. We must constantly strive to be open to new and fresh ideas that often seem strange and unusual. It is that care and that openness of mind along with the tremendous heartache of our patients that motivates us to delve ever deeper into our unusual specialty. *Attitude* is key to both practitioners and patients. It is often difficult to have an uplifting attitude when dealing constantly with chronically ill patients. However I have noticed that most of the therapists who treat these types of patients have 2 things in common—a great and uplifting attitude and previous experience with chronic pain themselves or in their immediate family. They know how important it is to have a coach who empathizes and cares. In one recent study taken over 20 years with 13,000 patients, Dr Hans Eyseneck evaluated patients in relation to attitude and broke them into 4 categories. Type 1 had a lifelong attitude of hopelessness or were severely depressed. Type 2 had a lifelong pattern of severe anger or feeling that someone had wronged them. Type 3 individuals seemed to drift between hopelessness and anger. Type 4 individuals were considered well adjusted. After 15 years, he found that 75% of all who died of heart disease were Type 2 and 75% who died of cancer were Type 1.Further he found that 15% who died of cancer were Type 2, and 15% who died of heart disease were Type 1. Less than 1% of those who died from cancer or heart disease were Type 4! Our attitude is contagious and often it is one of the things that our patients can hold on to and helps to bring them back from the brink. As therapists we become confidants and often can steer proper courses for attitudes just by listening and pointing out strategies for improvement just as we do home exercise. As Ben Sweetland once said, "Success is a journey, not a destination."

In closing, I wish to congratulate our previous President, Tom Watson on attaining his DPT with the Ola Grimsby Institute and to each and every one of you who is presently working toward advancement in our special practice area. Remember Voltaires' words, "No problem can stand the assault of sustained thinking."

Have a wonderful and blessed holiday season. Keep those new ideas flowing into this media so that we can all share in our growth. I hope to see many of you at the CSM in New Orleans this February.

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CALENDAR OF EVENTS

- The home study course **BASIC SCIENCE FOR ANIMAL PHYSICAL THERAPISTS** is still available. Contact 800-444-3982 or 608-788-3982 for more information.

THE ANIMAL PHYSICAL THERAPIST SPECIAL INTEREST GROUP (ANIMAL SIG) UPDATE

1. Proceedings of the 2nd International Symposium for Rehabilitation and Physical Therapy in Veterinary Medicine – August 2002, Knoxville, TN. Available now for $20. They are a great resource. Contact David Levine at david-levine@utc.edu.
2. Orthopaedic Section member and nonmember directories are available through the Section Office 800-444-3982 Fax: 608-788-3965 or E-mail: tfred@orthopt.org. There currently are 544 members.
3. State Liaisons: To date there are 33 states that have Animal SIG Liaisons. Contact Charles Evans at chazzzevans@netscape.net for more information.
4. The APTA has a web site that lists all of the State Practice Acts: www.apta.org/advocacy/state/state-practice.
5. If you would like to have your clinic listed on the Animal Physical Therapy SIG website, please contact Debbie Gross Saunders at WizofPaws@aol.com.

3rd INTERNATIONAL SYMPOSIUM ON REHABILITATION AND PHYSICAL THERAPY IN VETERINARY MEDICINE AUGUST 7-11, 2004

The third iteration of this series of symposia was held in Research Triangle Park, NC and was sponsored by the North Carolina State College of Veterinary Medicine. Denis J. Marcellin-Little, DEDV, DACVS & ECVS, CCRP served as Conference Chair. Organizing Committee Members included David Levine, PT, PhD, OCS, CCRP; Richard Mansmann, VMD, PhD; Darryl Millis, DVM, MS, DACVS, CCRP; and, Christine King, BVSC, MACVSc. Dr. Marcellin-Little welcomed the participants and opening remarks were made by Dr. Oscar Fletcher, Dean, NC State University, College of Veterinary Medicine.

Over 317 participants attended the conference from the United States and other countries including: Australia, Austria, Brazil, Canada, Finland, France, Italy, Japan, The Netherlands, South Africa, Sweden, Switzerland, and the United Kingdom. Registrants came from the fields of veterinary medicine, physical and occupational therapy, massage and bodywork, and others with interest in rehabilitation of animals.

KEYNOTE ADDRESS

The Keynote Address was given by Robert Taylor, DVM, MS, Dip. ACVS, CCRP and was titled "20 Years of Rehabilitation – Where Are We Now?" Dr. Taylor indicated there is a growing need for research to foster evidence-based practice in order to improve credibility in animal rehabilitation. He mentioned that in his state of Colorado, anyone 18 years old or older could be employed by a veterinarian to provide rehabilitation services for animals. However, he has worked in collaboration with physical therapists for many years and defends this practice. He remarked that recent legislation in Nevada was encouraging for the advancement of professional rehabilitation services for animals. (This amendment to the veterinary medicine regulations, recognizing "animal physical therapy" provided by veterinarians, veterinary technicians, and physical therapists

can be viewed at: http://www.leg.state.nv.us/Register/2004 Register/R009-04I.pdf).

EXHIBITORS

Exhibitors included vendors of many types of rehabilitation equipment. Electro-therapeutic devices were on display including electrical stimulators, low level laser, ultrasound, pulsed electromagnetic field, shock wave, and others. Two manufacturers of under water treadmills and aquatic therapy systems had displays. Two manufacturers of carts and wheelchairs for dogs were present with many examples of their craftsmanship and success stories. There were vendors of hot and cold therapy and splinting and bracing appliances. Representatives from the veterinary pharmaceutical industry were present. Two USA certification programs had booths with information about their courses in canine and equine rehabilitation. There were book sales available. A brand new product was introduced to quantify lameness and effectiveness of therapeutic interventions that is a quadruped biofeedback system for detecting weight distribution and contact forces. Also present were companies specializing in herbal supplement and nutritional products to manage different disease conditions in animals.

LECTURES AND LABS

Lecture presentations were divided into small animal and equine sessions. Although these were primarily about dogs and horses, there were also presentations on cats, birds, and even a kangaroo! Basic science, evaluation, and treatment techniques for rehabilitation of musculoskeletal and neurological disorders were given. Topics included functional and conformational assessment, gait analysis, management of acute and chronic pain conditions, therapeutic exercise, prosthetics/orthotics, manual therapy, acupuncture, and electro-therapeutic devices. Talks were presented on current state of the art in diagnostic equipment, therapeutic modalities, surgical techniques, and postoperative rehabilitation. Breakfast forums gave participants the opportunity to engage with selected speakers on focus topics.

Laboratory sessions on canine rehabilitation fundamentals were held at NC State University, College of Veterinary Medicine. Canine therapy labs were held at Arbor Creek Animal Wellness & Rehabilitation Clinic. And equine therapy labs were held at the Hunt Horse Complex. These offered a wide variety of assessment and treatment techniques.

INTERNATIONAL ACADEMY OF ANIMAL REHABILITATION ORGANIZATIONAL MEETING

All were invited to attend an organizational meeting about the 'International Academy of Animal Rehabilitation.' Dr. Millis read a document regarding the formation and vision of this organization, which sounded like what was proposed at the 2nd Symposium in 2002. A copy of the 2002 draft is below.

International Veterinary Physical Rehabilitation Society

The purpose of this society shall be to promote the interdisciplinary collaboration of professions to facilitate the exchange of information, and to promote the study and use of physical agents for the benefit and appropriate treatment of animals to improve their quality of life.

This society shall encourage the exchange of information, scientific discovery, and evidence-based use of physical medicine and modalities, including responses of tissues to disuse and remobilization, cryotherapy, thermotherapy, ultrasound, electrical stimulation, therapeutic exercise, aquatic rehabilitation, massage, and manual therapy techniques.

The study and exchange of information regarding other physical modalities, such as chiropractic and acupuncture, will be encouraged where they pertain to the above mentioned physical modalities, but will not be a primary focus of this organization because organizations pertaining to these disciplines currently exist.

Membership in this society shall be comprised of individuals holding a professional license pertaining to veterinary medicine, physical therapy/physiotherapy, or a professional licensed in a discipline related to physical rehabilitation of animals.

Items relating to a model for this organization, vision, structure, communications, journal publication, membership, funding, meetings, research, and other topics were discussed. Keeping the Academy open to those from various fields was a general theme.

Future meetings were proposed to be held yearly, and then this was changed to every 2 years. A major concern was that the symposiums were becoming too "US-centric." It was tentatively decided that in every other 2 year cycle a symposium would be held in a country other than the United States. The next meeting will be held in the Netherlands in 2006 with Anke Vaessen as chair. Countries with representatives with interest in hosting a conference included Australia, Brazil, the United Kingdom, and others. A veterinary technician from the USA remarked that financially foreign travel would be difficult to justify on a technician's salary. And that this would be unfair as veterinary technicians would be the ones doing the rehabilitation.

Catherine McGowan, BVSc, MACVSc, PhD of Australia gave a presentation regarding an educational model for animal physiotherapy. Dr. McGowan is the coordinator of a Master's degree program at the University of Queensland. She noted how advancements in veterinary medicine left a gap for physiotherapists. This created problems as physiotherapy was not inclusive of animals other than humans and was also not included in veterinary medicine. Their solution was to form a veterinary medicine and physiotherapy team with a cross-disciplinary program between the veterinary and physiotherapy schools. She stated that the two professions work extremely well together. She further noted that this program is open only to physiotherapists and that veterinary technicians do not provide physiotherapy services. The program has an academic advisory board including the President of the Australian Physiotherapy Association and a representative from the Australian Veterinary Association.

Tracy Crook, Veterinary Physiotherapist, from the Royal Veterinary College in England described their program. This Master's degree course is only available to chartered physiotherapists with more than one year of experience. She stated that they are committed to annual meetings and evidence-based practice. It was noted that of 56 research and clinical papers presented at the symposium, 10 came from the Queensland and Royal Veterinary College programs.

Evidence-based practice was emphasized throughout and Dr. Marcellin-Little stated that research is the critical foundation of the field. He further indicated however, that con-

ferences and journals should have more to offer than research in order to reach a wider audience. Dr. Millis suggested a 2-tiered system, one for newcomers and the other for more experienced clinicians.

Other international organizations were proposed at the symposium, including one sponsored in France on veterinary osteopathy. There is certainly more to come on these developments.

VETERINARIAN MEETING

A group of veterinarians with an interest in rehabilitation held a meeting to form an organization of their own. Some of the goals of this group were reported. They are seeking to engage in dialog with the APTA by establishing an interest group in the AVMA that is parallel to the Animal Physical Therapist Special Interest Group. They would like to eventually lobby the AVMA to make rehabilitation a boarded specialty in veterinary medicine.

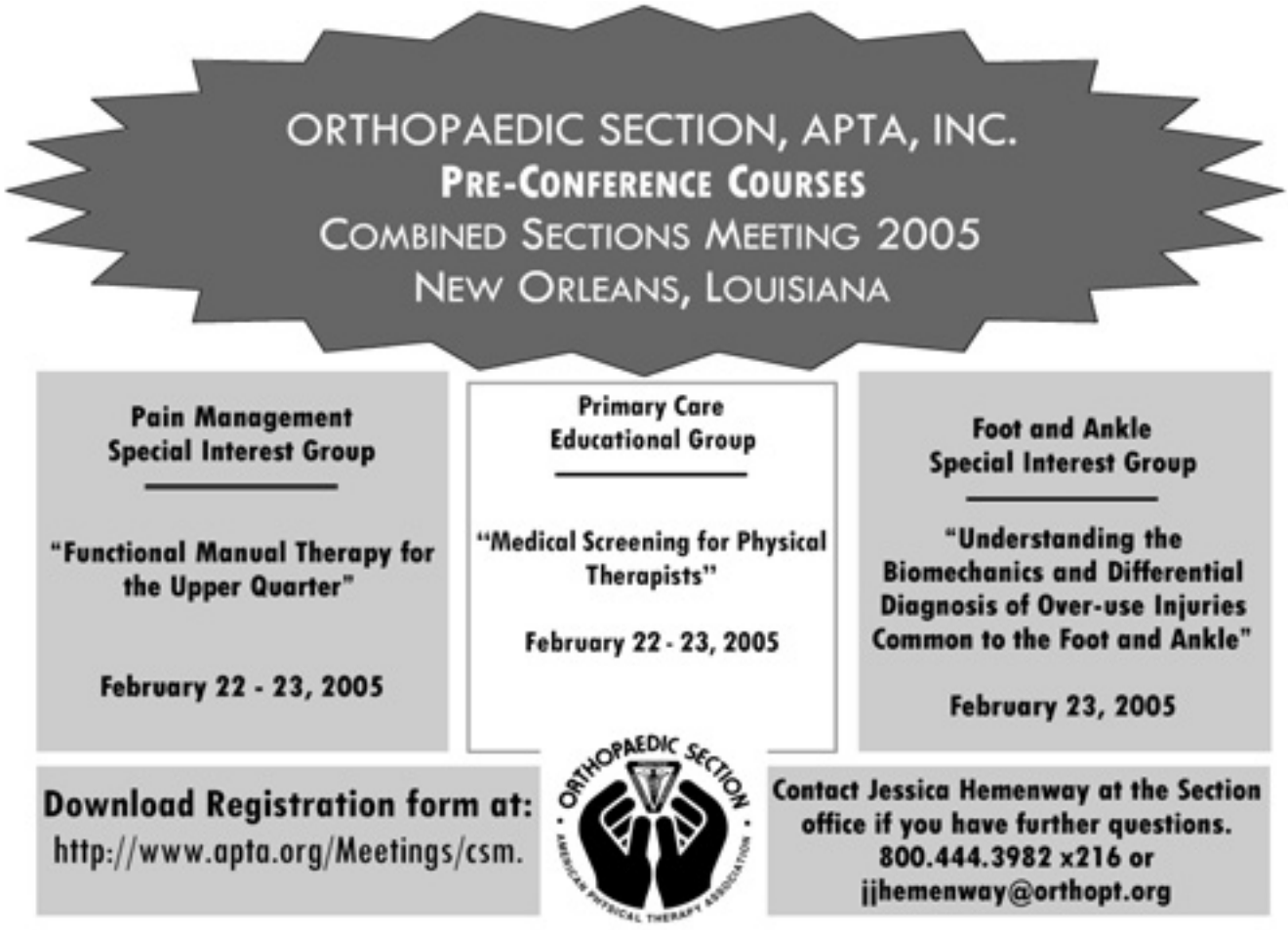
DINNER AND ENTERTAINMENT

After an early evening of socializing, a scrumptious dinner buffet was provided in the Imperial Ballroom. Mike Cross entertained the participants with an eclectic show drawing on his more than 30 years in the music industry. He played both traditional and self-composed folk, blues, country, pop, blue grass, rap, and other tunes on guitar and fiddle. In between songs he told jokes and stories from the sublime to the most zany and silly things ever spoken. His one-man band jam session with impressions of Eddie Van Halen on guitar solo and Ginger Baker on drum solo was truly unforgettable. He had the crowd rolling with laughter and received a standing ovation. For an encore he played a rousing rendition of the old fiddle tune "Same Old Man Working at the Mill."

CLOSING

At the closing of the symposium participants were invited to the NC State University, College of Veterinary Medicine campus. Those who took this offer were treated to a private tour given by Dr. Mansmann. He explained that this was the youngest veterinary college in the nation with its first graduating class in 1984. Evidence of growth was revealed in the construction of new facilities for teaching and research. Dr. Mansmann described all the exciting plans for expansion of this fine campus. In closing he told the group that it is never too late to go back to school.

Submitted by Steven J. Strunk, PT



Clinical Residency 101: *Getting Started and Doing it Well*

A one-day, pre-conference course to Combined Sections Meeting (CSM)

DATE: **Wednesday, February 23, 2005, 8:00am to 5:00pm**
LOCATION: **New Orleans, Louisiana**

PRESENTERS: **Carol Davis, PT, EdD, MS, FAPTA, Greg Hartley, PT, MSPT, GCS, Rita Wong, PT, EdD, and Rob Landel, PT, DPT, OCS**

Co-sponsored by Section on Geriatrics, APTA Committee on Clinical Residency & Fellowship Program Credentialing, and the following Sections: Acute Care, Cardiovascular and Pulmonary, Clinical Electrophysiology, Education, Neurology, Orthopaedics, Sports Physical Therapy, Women's Health, and Health Policy & Administration.

Course Description
This workshop will provide the tools needed for potential sites to develop and implement a successful post-professional clinical residency or fellowship program that meets the criteria for APTA credentialing. Questions to be addressed in the workshop include the following: What is the difference between a residency and a fellowship? Who should consider hosting a residency/fellowship? What are the benefits of becoming a credentialed program? How do I get my administration to buy into the concept? How can I make it cost effective? What are the nuts and bolts of preparing an application to APTA for credentialing? How do I become a mentor and/or how do I prepare mentors to teach in residency programs?

Intended audience
Individuals from physical therapy practices, university based PT programs, small independent clinical practices, and/or large corporate-based clinical practices interested in providing a credentialed clinical residency or fellowship program in physical therapy.

Members of co-sponsoring sections are eligible for the section member rate.
Multiple registrants from one facility are eligible for a multi-registrant discount.For more information or to request registration forms, visit the APTA web site at www.apta.org/meetings/csm or call 800/999-2782 ext 3395.

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