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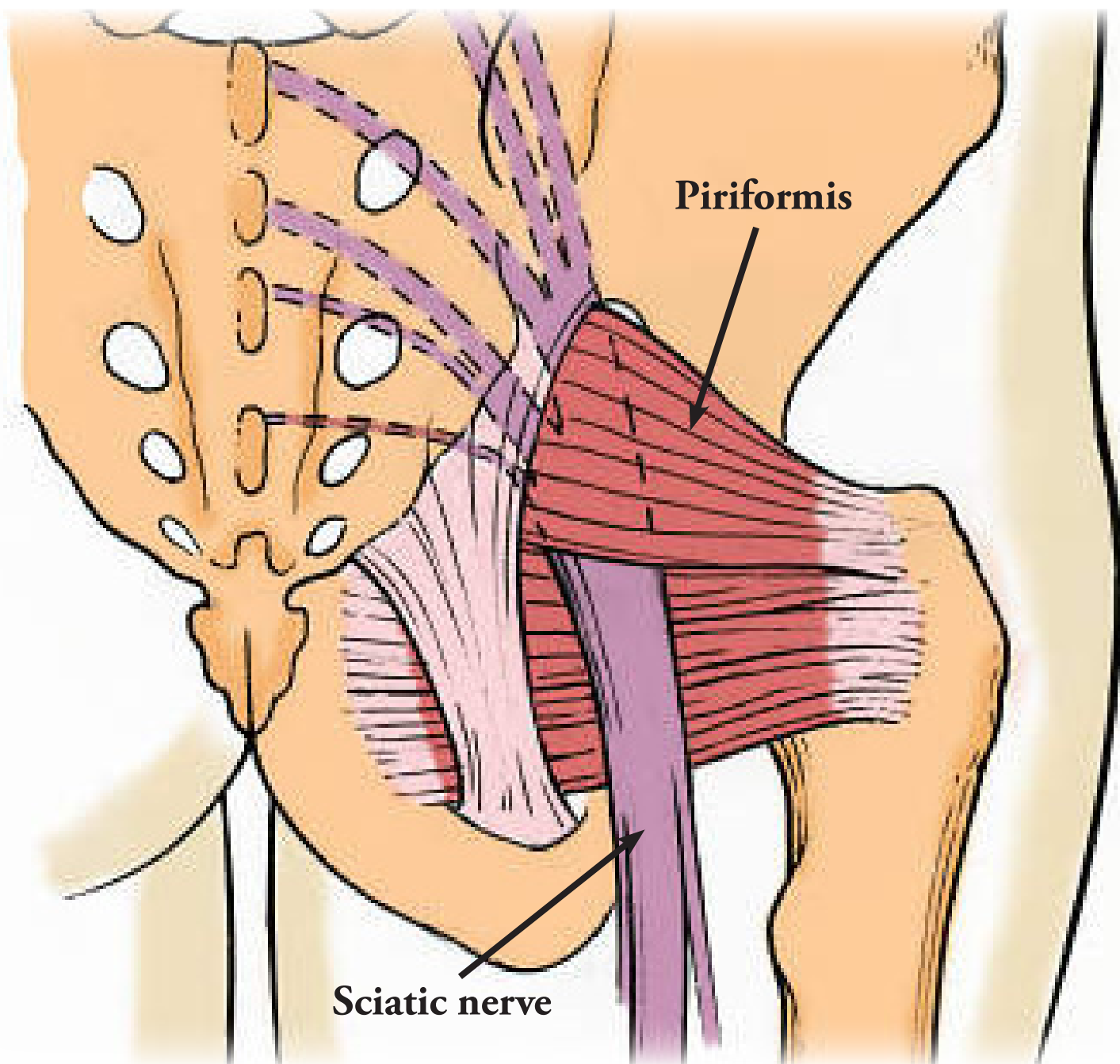
FORUM FOR OSTEOPATHIC THOUGHT

# JOURNAL

Official Publication of the American Academy of Osteopathy

TRADITION SHAPES THE FUTURE

VOLUME 24 NUMBER 3 NOVEMBER 2014



**Piriformis Syndrome: A Case Study...page 6**

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THE AAO FORUM FOR OSTEOPATHIC THOUGHT

# JOURNAL

Official Publication of the American Academy of Osteopathy®

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TRADITION SHAPES THE FUTURE • VOLUME 24 • NUMBER 3 • NOVEMBER 2014

*The mission of the American Academy of Osteopathy is to teach, advocate, and research the science, art, and philosophy of osteopathic medicine, emphasizing the integration of osteopathic principles, practices, and manipulative treatment in patient care.*

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# AAO Calendar of Events

**Mark your calendar for these upcoming Academy meetings and educational courses.**

## 2014–2015

November 17	LBORC Training Conference Task Force teleconference, 9 p.m. Eastern
January 1	FAAO applications due
January 15	Committee on Fellowship in the AAO teleconference, 8:30 p.m. Eastern
January 16-18	<b>Brain 1: Palpating and Treating the Brain, Brain Nuclei, White Matter and Spinal Cord</b> —Bruno J. Chikly, MD, DO (UK) (Hon), PhD—Midwestern University/Arizona College of Osteopathic Medicine in Glendale
January 28	Committee on Fellowship in the AAO teleconference, 8:30 p.m. Eastern
March 8-10	<b>Pre-Convocation Course: Brain, Vision, Membranes and Cerebrospinal Fluid</b> —Bruno J. Chikly, MD, DO (UK) (Hon), PhD—Kentucky International Convention Center in Louisville
March 8-10	<b>Pre-Convocation Course: FDM of the Axial Spine—Module 2</b> —Todd A. Capistrant, DO, MHA—Kentucky International Convention Center in Louisville
March 11-15	<b>AAO 2015 Convocation—Life in Motion: The Science, Philosophy, and Art of Osteopathic Medicine</b> —Richard G. Schuster, DO, program chair—Louisville Marriott Downtown in Kentucky and the Kentucky International Convention Center

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## CONTINUING MEDICAL EDUCATION QUIZ

The purpose of the November 2014 quiz—found on page 11—is to provide a convenient means of self-assessing your comprehension of the scientific content in “Piriformis Syndrome: A Case Study” by Jessica Meli Lee, OMS III, and Kate McCaffrey, DO.

Be sure to answer each question in the quiz. The correct answers will be published in the next issue of the *AAOJ*.

To apply for two credits of AOA Category 2-B CME, fill out the form on Page 11 and submit it to the American Academy of Osteopathy. The AAO will note that you submitted the form and forward your results to the AOA Division of Continuing Medical Education for documentation. You must score a 70% or higher on the quiz to receive CME credit.





## View From the Pyramids

Dear colleagues,

This issue of *The AAO Journal* introduces a delightful potpourri of articles written by US-trained osteopathic physicians, international osteopaths, and osteopathic medical students.

*The AAO Journal* actively seeks to mentor and develop the voice of the next generation. In that spirit, we lead off with Jessica Meli Lee, OMS III, of the Western University of Health Sciences College of Osteopathic Medicine of the Pacific-Northwest in Lebanon, Oregon. Lee is the lead author of a practical and informative article on treating patients for piriformis point conditions. Also featured are the abstracts of 8 winners of the Louisa Burns Osteopathic Research Committee's 2014 poster presentation. Topics include the use of osteopathic manipulative treatment on osteopathic medical students, readmission rates of patients with diabetes, osteopathic medical students' health behavior, and the infectiousness of Alzheimer disease. Let us all continue to mentor these new writers and researchers for they are the future of osteopathic medicine.

As we go to press at the end of 2014, our profession is meeting several challenges. Voters rejected Proposition 46 in California with a two-thirds majority. The proposition would have raised the cap on damage awards in medical malpractice lawsuits; required drug testing of all California physicians; and mandated that prescribers access the California Substance Utilization Review and Evaluation System (CURES) database, which would have been unable to handle the expanded volume. If Proposition 46 had passed, it would have set a dangerous precedent for other states, threatening our privacy as physicians, our professional autonomy, and the viability of affordable health care access and delivery, especially in rural regions.

Finally, I am stepping down after 2 years of service as the scientific editor of *The AAO Journal* for family reasons. It has been a transitional 2 years for the journal, and I hope I have left it in better shape as I pass the torch to our interim scientific editor, Brian E. Kaufman, DO, FACP, FACOI. Dr. Kaufman will inherit a capable support team, including Kate Worden, DO, MS, the journal's associate editor; Michael E. Fitzgerald, its supervising editor; Lauren Good, its managing editor; Hollis H. King, DO, PhD, FFAO, the chair of the AAO Publications Committee; and the other esteemed members of the AAO Publications Committee. Producing any publication is a team effort, and I look forward to its next chapter.

Be well,  
Kate McCaffrey, DO

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ATSU-KCOM has two full-time OMM faculty positions open. Responsibilities include five half days academic and five half days clinical (outpatient and inpatient OMM consultation service). Great opportunity for residents graduating July 2014 or an OMM couple looking to work together in an academic practice. Now is a great time to apply and secure a position for 2014!

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# Piriformis Syndrome: A Case Study

Jessica Meli Lee, OMS III, and Kate McCaffrey, DO

## Abstract

Although controversial in its diagnosis, piriformis syndrome is often overlooked as a cause of sciatica. A 51-year-old female patient with chronic low back pain presented to a teaching clinic in the Pacific Northwest 2 weeks after the onset of pain in her left buttock and left leg. Osteopathic manipulative treatment (OMT) provided some relief, but it did not completely resolve her symptoms. This case study examines the implication of OMT in acute cases of piriformis-induced sciatica.

## History and Presentation

A 51-year-old Caucasian female patient with medical history significant for chronic low back pain (LBP) and left leg length discrepancy was seen at a teaching clinic in the Pacific Northwest with complaints of left leg pain and exacerbation of LBP for the previous 2 weeks. The patient was routinely treated with osteopathic manipulative treatment (OMT) to address LBP and was last seen 2 weeks prior to this visit. Since her previous office visit, the patient stated her “back seized up,” and she had experienced subsequent left leg pain. The patient denied having recent trauma or illness. She described the pain as varying from “sharp and shooting” to “throbbing and aching,” with the latter being a greater concern to the patient.

The patient described the pain as originating in her low back and left buttock and radiating down her posterior thigh, wrapping around to the anterior surface of the lower limb. She rated her pain as being 6 on a 10-point scale at its worst, and she noted that the pain was intermittent. She was careful to avoid provoking factors, which included sitting, extension of the left lower leg, and the supine position (making it difficult to sleep). Palliating factors included standing and stretching and internal and external rotation of the left hip. Over-the-counter ibuprofen and acetaminophen seemed to improve symptoms temporarily. The patient denied having feelings of numbness or tingling, loss of strength, or loss of sensation to touch. She reported no decrease in performance of activities of daily living, but she avoided sitting at work in order to quell the pain. The patient also noted that she had been placing more weight on her right leg since her symptoms began. Although she did not report difficulties with ambulation, she felt that she

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needed to be overly cautious. She sought relief via adjustment or stretching and the use of a 4 mm lift for her short left leg. Although the patient feared that her symptoms were worsening, she expressed wishes to avoid prescription pain medication and imaging, and she had an immediate reluctance for surgical intervention.

The patient had no surgical history. Her family history was significant for controlled hypertension in her mother and substance abuse in her sister. The patient was unmarried and lived alone with six pets in a home she owned. The patient was a teacher at a special needs school. She denied any history of tobacco, alcohol, or illicit drug use. She routinely walked 2 miles a day for exercise, but she noted that she had decreased exercising due to pain.

## Physical Examination

On physical exam, the patient had a blood pressure of 120/83 mmHg, a heart rate of 86, and a respiratory rate of 14. Her height

*Continued on page 7*

*Continued from page 6*

was 5'4" (163 cm) and her weight 123 lbs (56 kg). The patient was well groomed, well developed and well nourished. She was alert and oriented to person, place, and time. She was not in acute distress. However, the patient paced the exam room because sitting exacerbated pain in her left buttock and leg. The cardiac exam revealed a regular rate and rhythm, normal S1/S2, without appreciation of murmurs, rubs, or gallops. Lungs were clear to auscultation bilaterally, without adventitious sound. A neurological examination revealed intact sensation to light touch and +5/5 muscular strength of the bilateral upper extremities and lower extremities. Deep tendon reflexes were +2/4 in the bilateral biceps, patellar, and Achilles tendons.

The osteopathic structural exam revealed widespread somatic dysfunction. In her cervical spine, the atlanto-occipital joint was extended, sidebent left, and rotated right. The atlanto-axial joint was rotated right, C3 was flexed with sidebending and rotation to the left, and C7 was found to be flexed with sidebending and rotation to the right. Counterstrain points were tender at LC1 and AC1-5 on the right. Thoracic dysfunction was significant for T5-T9 neutral, sidebent left, and rotated right. In the lumbar region, L3-5 were neutral, sidebent right, and rotated left with a tender counterstrain point of AL1 on the left. The patient had a positive seated and standing flexion test on the left, an anteriorly rotated innominate bone on the left, and a tender inguinal counterstrain point on the left. The straight leg raise test was positive on the left. The flexion, abduction, and external rotation (FABER) exam was negative bilaterally, but the patient was noted to be guarding on the left during the FABER examination. The patient had pain with flexion, abduction, and internal rotation of the left hip. The patient had an R/R forward sacral torsion and tender counterstrain points of the left piriformis and lower pole fifth level (LP5L). Examination of leg length discrepancies revealed a short leg on the right, though the patient had a previous diagnosis of short left leg.

### **Treatment**

Osteopathic manipulative treatment (OMT) was performed to correct the somatic dysfunctions found on physical examination. Counterstrain was used initially to address all tender points in the cervical, lumbar, pelvic, and sacral regions. Soft tissue and muscle energy techniques were then applied to the areas of dysfunction in hope of improving range of motion. After treatment, the patient reported a notable decrease in pain, but her symptoms persisted.

The patient was informed of potential pathology, including piriformis syndrome, sciatica, disk herniation, spondylolisthesis, rheumatoid arthritis, osteoarthritis, and compression fracture. The patient was instructed to continue with ibuprofen treatment, 400 mg to 800 mg up to 3 times daily as needed, for analgesia and anti-

inflammation. The patient was given information on piriformis syndrome and sciatica to take home, and she was shown proper stretching techniques.

Further discussions were held regarding ongoing treatment. The patient was open to the idea of imaging her lower spine. Because the patient remarked that she would not elect surgical intervention, caudal epidural corticosteroid injections were discussed as a possible nonsurgical treatment for LBP and radiculopathy. The patient requested more information and indicated that she would consider beginning corticosteroid treatment on follow-up in addition to manipulation.

### **Discussion**

First described by Freiburg and Vinke in 1934 and later confirmed by researchers such as Robinson and Te Poorten, piriformis syndrome is a neuromuscular condition characterized by low back, hip, buttock, and leg pain.<sup>1</sup> It often results in compressing the sciatic nerve, leading to peripheral radiculopathy of the ipsilateral lower limb. Common features include tenderness over the greater sciatic notch and aggravation of symptoms with sitting and stretching of the piriformis muscle.<sup>1</sup> Piriformis syndrome is thought to be more prevalent in women than men, often occurring in the fourth to fifth decades of life. Although much research has been conducted on the discogenic causes of sciatica, piriformis syndrome

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For more information on terminology  
used in *The AAO Journal*, see the

## **Glossary of Osteopathic Terminology**

developed by the American  
Association of Colleges of Osteopathic  
Medicine's Educational Council  
on Osteopathic Principles.

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as a nondiscogenic cause is often overlooked as a diagnosis. As a result, its true prevalence is unknown.<sup>2</sup>

Derived from L4-S3 nerve roots, the sciatic nerve is the largest nerve in the body. Containing both preaxial and postaxial branches, the sciatic nerve exits the greater sciatic foramen anterior (deep) to the inside of the piriformis muscle, extends posterior (superficial) to the short external rotators, and bifurcates at the apex of the popliteal fossa into the common peroneal and tibial nerves. It has mixed functions, providing both motor and sensory innervation.<sup>3</sup> The sciatic nerve's function is primarily external rotation of the hip and, to a lesser extent, abduction and flexion.<sup>1</sup>

The piriformis muscle originates on the anterior surface of S2-4, the sacroiliac joint, the anterior sacrospinous ligament, and the sacrotuberous ligaments. It inserts into the superior medial aspect of the greater trochanter of the femur. Innervation of the piriformis is supplied by (L5)S1-2, and the piriformis provides postural stability during ambulation and standing.

Congenital anatomical variation in both the sciatic nerve and piriformis is found in 15% to 30% of the population. Common variations include proximal bifurcation of the sciatic nerve, resulting in the tibial branch passing either superiorly or inferiorly to the

piriformis; a bifid piriformis; and the sciatic nerve passing posterior (or superficial) to the inside of the piriformis muscle.<sup>2</sup>

Sciatica is a relatively common condition with a lifetime prevalence of 13% to 40%.<sup>4</sup> Stafford et al<sup>4</sup> found positive factors for developing sciatica to include increasing height (older age groups only), increasing age, genetic predisposition, a history of walking and jogging, seated occupations, and smoking. Gender, body mass, and parity typically have no influence on the development of sciatica. Prior to the work of Freiburg and Vinke, a herniated intervertebral disk was thought to be the dominant cause of sciatica. In addition to being caused by piriformis compression, nondiscogenic-induced sciatica can result from spinal stenosis in the lumbar canal, from a pelvis without piriformis involvement, and from injury to any point along the normal course of the nerve.<sup>1</sup> Pain can also be referred from the abdominal and pelvic viscera.

Boyajian-O'Neill et al<sup>2</sup> described piriformis syndrome as either primary or secondary in etiology. Primary piriformis syndrome is due to an anatomic variant as described above, and secondary piriformis results from trauma, overuse, and ischemic effects. According to this research, fewer than 15% of patients with piriformis syndrome have primary causes. The most common symptoms include the following:<sup>2</sup>


- pain with sitting, standing, and lying longer than 20 minutes.
- pain or paresthesia radiating from the sacrum through the gluteal region and down the posterior thigh.
- pain decrease with ambulation.
- pain when rising from a seated position.

It is important for physicians to elicit a complete history and to inquire about recent trauma and repetitive exercise, such as walking and jogging. During physical examinations, clinicians should assess patients for common clinical signs, paying extra attention to the lumbar spine, pelvis, sacrum, and leg length discrepancies. A neurologic exam including deep tendon reflexes, muscle testing, and sensation testing also will provide insightful information. Common clinical signs include tenderness in the sacroiliac joint, greater sciatic notch, and piriformis muscle; asymmetrical weakness in the affected limb; and restriction in range of motion. Specific tests for sciatica include the Freiburg, Pace, FAIR (flexion, abduction, internal rotation of hip), Beatty, and Lasegue tests.

Still, the diagnosis of piriformis syndrome remains controversial: Only 21 out of 29 surveyed physical medicine and rehabilitation specialists in the United States believe the condition exists.<sup>1</sup> A 10-year study published in 2002 by Fishman et al<sup>9</sup> aimed to

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definitively define piriformis syndrome by using electromyography (EMG). Boyajian-O'Neill et al<sup>2</sup> stated that EMG may assist in differentiating piriformis syndrome from intervertebral disk herniation. However, studies performed by Fishman et al<sup>9</sup> have been largely criticized by the scientific community for failing to meet standard diagnostic reporting criteria.<sup>1</sup> Hopayian et al<sup>1</sup> do not favor using EMG in clinical practice.

Although a clear diagnostic definition of piriformis syndrome remains to be established, studies published by Boyajian-O'Neill et al<sup>2</sup> and Hopayian et al<sup>1</sup> agree on the clinical presentation of piriformis syndrome as described earlier in this article.

For discogenic sciatic neuralgia, the initial intervention historically has been surgical removal of the offending herniated intervertebral disk. However, this approach often failed to provide symptomatic relief, and pressure on the nerve root has been positively correlated with loss of function rather than with pain.<sup>4</sup> Nerve root impingement is now understood to involve not only compression but also inflammatory and immune responses.

Anti-inflammatory agents, such as nonsteroidal anti-inflammatory drugs (NSAIDs), and myorelaxants can help to control pain and spasm. Ice and heat also help to temporarily relieve symptoms, and progressive stretching like routine OMT and physical therapy improves flexibility and increases strength.<sup>5</sup> Other nonpharmacological treatments include psychotherapy, cognitive behavioral therapy, and acupuncture.<sup>4</sup> Anticonvulsants, tricyclic antidepressants, serotonin-norepinephrine reuptake inhibitors, and opioids are the pharmacological agents used for radiculopathy. Seventy-nine percent of patients experience symptom reduction with initial conservative therapy.<sup>2</sup>

Boyajian-O'Neill et al<sup>2</sup> described an osteopathic approach to diagnosing and managing patients with piriformis syndrome. Osteopathic physicians should use OMT to address somatic dysfunction with indirect, direct, passive, and active modalities. Counterstrain and facilitated positional release are the favored indirect techniques for patients with piriformis-induced sciatica. In deciding which modalities to use, it is important for clinicians to keep in mind the following factors: Does the patient have primary or secondary piriformis involvement, acute inflammatory or chronic fibrosis, or functional or structural implications?<sup>6</sup> According to Fligg,<sup>6</sup> indirect maneuvers are favored over direct techniques. The author goes on to argue that stretching in the acute phase may increase the inflammatory response, thereby further entrapping the sciatic nerve. For chronic cases, either indirect or direct pressure techniques may be applied.

Maxwell<sup>7</sup> describes using trigger point therapy prior to adjustment in the acute phase. This can be accomplished by applying a constant heavy thumb, ultrasound, or muscle stimulator over the affected area for approximately 30 seconds or until the spasm is released. Applying 30 lbs of pressure (eg, a physician's elbow) over the affected area has been found to be the most effective method of release.<sup>7</sup>

If patients fail to respond to manipulation, researchers suggest following up with acupuncture or injection of trigger points with lidocaine hydrochloride, corticosteroids, or botulinum toxin type A.<sup>2</sup> Additionally, patients have been shown to benefit from therapeutic ultrasound. Those refractory to pharmacologic and nonpharmacologic therapy are candidates for surgical decompression.<sup>2</sup>

Lumbar and caudal epidural corticosteroid injections have become a mainstay in the treatment of patients for sciatica, although evidence is lacking in consistency regarding the number of injections, ideal volume, the content of the injectate, the need for fluoroscopy, the most effective route, and long-term benefits.<sup>4</sup> Computed tomography or magnetic resonance imaging can be used to more accurately guide clinicians with injections.<sup>8</sup> Studies regarding the efficacy of prolotherapy for patients with neuropathic pain remain to be published, but prolotherapy is being used experimentally, and there are already some reports of successful treatment.

Studies have shown that lumbar and caudal epidural corticosteroid injections are safe procedures with rare and temporary side effects.<sup>4</sup> Infection at the site of injection is the most common reported complication. Serious complications such as nerve root damage, epidural hematoma, and abscess are rare. Other systemic side effects include cushingoid symptoms such as obesity, hypertension, hirsutism, diabetes, immunosuppression, and changes in menses. Several cases of dural puncture have been reported, resulting in headache. Patients may experience a temporary increase in sciatic neuralgia, as well as syncope, stiff neck, flushing, urinary retention, hypotension, and vomiting. These effects typically do not require treatment.<sup>4</sup>

## **Conclusion**

Primary care physicians and specialists have ample opportunity to change the lives of patients suffering from either acute or chronic sciatic neuralgia. While a concise diagnostic definition of piriformis syndrome remains unclear, osteopathic physicians are uniquely equipped to care for patients with low back, buttock, and leg pain.

*Continued on page 10*

*Continued from page 9*

Nascent clinicians should be aware that although it is noted in this case study, sciatic neuralgia is not always a component of piriformis syndrome.

Clinicians can offer patients proven neuromuscular symptomatic reduction with conservative treatment, including OMT and pharmacologic therapy. And with corticosteroid epidural injections, physicians can offer minimally invasive treatment before resorting to surgery. This approach will reduce patients' healthcare costs and decrease their recovery time, complication rate, and time in physical rehabilitation, thereby improving the overall quality of life for those we serve.

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Edward Via College of  
Osteopathic Medicine

**CAROLINAS**

The Edward Via College of Osteopathic Medicine (VCOM) is seeking a board-certified NMM/ OMM physician to serve as Chair of the Department of Osteopathic Manipulative Medicine for the Carolinas campus in Spartanburg, South Carolina. Spartanburg sits comfortably at the foothills of the Blue Ridge Mountains in upstate South Carolina. It's nestled between both Atlanta and Charlotte and is only a short drive from Asheville. This beautiful community possesses a rich culture, delicious food and a breath-taking landscape.

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**Authors:** Jessica Meli Lee, OMS III,  
and Kate McCaffrey, DO

**Publication:** *The AAO Journal*, Volume 24, No. 3,  
November 2014, pages 6-10

AOA Category 2-B credit may be granted for this article.

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Complete the quiz to the right by circling the correct answers. Mail your completed answer sheet to the American Academy of Osteopathy. The AAO will forward your results to the American Osteopathic Association. You must answer 70% of the quiz questions correctly to receive CME credits.

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1. For the patient described in this case report, where did her pain originate?
  - a) low back and left buttock
  - b) right quadricep
  - c) left latissimus dorsi
  - d) external oblique
2. Which of the following factors provoked the patient's pain?
  - a) sitting
  - b) extending her left lower leg
  - c) lying down
  - d) all of the above
3. Piriformis syndrome is more common in men than in women.
  - a) true
  - b) false
4. Which of the following describes using trigger point therapy?
  - a) Boyajian-O'Neill et al
  - b) Fligg
  - c) Maxwell
  - d) Ozisik et al

Answers to *The AAO Journal's* June 2014 quiz:

1. E
2. C
3. D
4. C

Answers to the *AAOJ's* November 2014 CME quiz will appear in the December 2014 issue.

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# Association Between Lumbar Counterstrain Tender Points, Symptoms, and Lumbar Vertebral Somatic Dysfunctions in Osteopathic Medical Students

Sarah E. Van Dine, OMS IV; Sheldon C. Yao, DO; and To Shan Li, DO

## Introduction

### Context

Counterstrain is the fourth most common osteopathic manipulative treatment modality, and it is a key component of the teaching curriculum for undergraduate osteopathic medical education.<sup>1,2</sup> In osteopathic manipulative medicine (OMM), effective counterstrain treatment depends on the proper diagnosis of tender points (TPs), which are small (<1 cm), nodular, edematous, tender-to-palpation nodules located in fascia, muscle, and ligaments.<sup>3,4</sup>

### Objective

This study aims to assess a specific group of tender points taught in the osteopathic medical curriculum—the anterior and posterior lumbar tender points. Specifically, we wish to analyze the frequency of occurrence of these points in a cohort of osteopathic medical students, the association of these TPs to co-existing symptoms as described in the literature, and their association to segmental somatic dysfunctions at the respective, corresponding vertebral level.

### Methods

Data were collected at the New York Institute of Technology College of Osteopathic Medicine (NYIT-COM). Osteopathic medical students used a worksheet in a laboratory setting to identify whether their laboratory partners have (1) lumbar TPs, (2) posterior lumbar transverse processes, and (3) associated symptoms (abdominal, urinary, low back pain, and lower extremity symptoms).

### Results

Of the 572 osteopathic medical students who participated, 48.4% (277) reported associated symptoms. Worksheets of respondents (n=394) checked by NYIT-COM OMM faculty were analyzed. Female respondents were at 2.35 and 1.91 greater odds for having an anterior lumbar 3 (AL3) and 4 (AL4) TP, respectively, and at 1.74 and 1.61 greater odds for having a posterior lumbar 1 (PL1) and 5 (PL5) TP, respectively, on either the spinous or transverse processes. Respondents reporting low back pain were 1.75 to 2.88 times more likely to have a TP at posterior lumbar levels 3 through 5 (PL3, PL4, PL5). Each posterior lumbar transverse process TP was

From the New York Institute of Technology College of Osteopathic Medicine, Old Westbury.

NYIT-IRB No. 1002

*This submission tied for second place in the students' clinical research category in the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held on March 21 at the AAO Convocation in Colorado Springs, Colorado.*

found to be significantly related to a unilateral posterior transverse process at the corresponding vertebral level ( $p<.001$ ).

### Conclusions

This preliminary study suggests that the association of lumbar TPs to underlying symptoms and of structural relationships to corresponding vertebrae may not be as reliable for diagnostic purposes as stated in osteopathic medical texts.<sup>3,5</sup> This study also has educational implications. It provides a further framework both for effectively incorporating simulated patient encounters and for identifying high-yield TPs to be included in osteopathic laboratory sessions.

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# Effects of Osteopathic Manipulative Treatment (OMT) in Lowering Perceived Stress in Medical, Dental, and Pharmacy Student Populations

**Kenneth Lee Frye, OMS III; Christopher J. Williams, DO; Brooke N. Johnson, DO; Thomas A. Quinn, DO; and Thomas James Fotopoulos, DO**

## Introduction

Burnout, suicidal thoughts, and other conditions associated with stress are common among students in medical, dental, and pharmacy schools. These high-stress environments often lead to conditions affecting multiple body systems and impaired emotional and cognitive modalities. Physiologically, increased stress is related to a fall in secretory immunoglobulin A (sIgA), producing an environment in which otherwise healthy individuals are susceptible to disease. Osteopathic medicine, specifically osteopathic manipulative treatment (OMT), has historical roots in being used to treat patients holistically, ensuring that attention is paid to mind, body, and spirit. OMT, therefore, was hypothesized to reduce stress and increase sIgA among students in the health professions.

## Methods

A total of 102 study participants were deidentified and randomly assigned to 3 groups: directed treatment (DT), nondirected treatment (NDT), and control. Both the DT and NDT groups received 20 minutes of treatment specific to those groups once a week for 4 weeks with a 10-minute supine rest period post-treatment. DT consisted of treatments targeting core areas, and NDT primarily focused on noncore areas. Treatments were performed by trained second-year osteopathic medical students who were overseen by OMT faculty. All study participants completed electronic self-perceived stress scale (PSS) questionnaires weekly, including before (survey 0) and after (survey 5) the treatment period. They also provided sIgA saliva samples. Data were analyzed using retrospective independent sample *t*-tests.

From the Lake Erie College of Osteopathic Medicine-Bradenton in Florida

*This submission tied for second place in the students' clinical research category in the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held on March 21 at the AAO Convocation in Colorado Springs, Colorado.*

## Results

The average change in PSS between surveys 1 and 4 and in sIgA levels between the DT and control groups significantly differed (CI=0.1 to 6.7,  $P=.044$ ; CI=1.095-20.417,  $P=0.030$ , respectively). PSS between surveys 0 and 4 and sIgA between the NDT and control groups differed significantly (CI=1.6 to 11,  $P=.009$ ; CI=7.400-24.469,  $P=0.000$ ). PSS between surveys 0 and 4 and sIgA between the NDT and DT groups significantly differed (CI=-.95 to -.27,  $P=.038$ ).

## Conclusion

The DT and NDT groups demonstrated reduced physiological and perceived stress. A greater reduction in perceived stress was observed in the NDT group than the DT group. Osteopathic manipulative treatment was shown to be effective in reducing distress in health professions students. Further studies should investigate errors in treatment, differences between the curricula of different health professions schools, and the greater reduction of stress seen in the NDT population.

The abstracts presented in this issue of *The AAO Journal* comprise one-half of the winners of the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held March 21 at the AAO Convocation in Colorado Springs, Colorado. You may read the 8 other winning abstracts on pages 19-26 of the [June issue](#) of *The AAO Journal*. The abstracts have been edited to adhere to *The AAO Journal's* style guidelines.

# BRAIN 1: PALPATING AND TREATING THE BRAIN, BRAIN NUCLEI, WHITE MATTER AND SPINAL CORD

January 16-18, 2015 • Midwestern University/Arizona College of Osteopathic Medicine in Glendale

## Course Description

This is a Level 5 course that explores different paradigms by working extensively with the brain parenchyma, its gray matter and its white substance. This advanced course trains health care professionals to address the physiology and specific structures of the brain and spinal cord. These structures are often unaddressed key or other primary somatic dysfunctions.

Participants will learn techniques for the whole ventricular fluid system and the brain parenchyma. They also will discuss the major components (nuclei) of the brain and learn different techniques to help release them, including corpus callosum, fornix, thalamus, putamen, globus pallidus, caudate nucleus, amygdaloid bodies, hippocampus, mamillary bodies, red nucleus, substantia nigra, pituitary, hypothalamus, cerebellum and associated nuclei.

Registrants are required to have previously completed a 40-credit introductory course in osteopathic cranial manipulative medicine approved by The Osteopathic Cranial Academy.

## Course Location

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19555 N. 59th Ave.  
Glendale, AZ 85308

## Program Chair

**Bruno J. Chikly, MD, DO (UK) (Hon), PhD**, is a graduate of the medical school at St. Antoine Hospital in Paris, France. Dr. Chikly also has the French equivalent of a master's degree in psychology. He received an honorary DO degree from the European School of Osteopathy in Maidstone, Kent, in the United Kingdom, and a PhD in osteopathy from the Royal University Libre of Brussels in Belgium. He is the author of the book *Silent Waves: The Theory and Practice of Lymph Drainage Therapy*, as well as the creator of a DVD titled *Dissection of the Brain and Spinal Cord*.



## Course Times

Friday, Saturday, and Sunday: 8 a.m.–5:30 p.m.  
Breakfast and lunch provided. Please contact the AAO's Sherrie Warner with special dietary needs at (317) 879-1881, ext. 220, or [swarner@academyofosteopathy.org](mailto:swarner@academyofosteopathy.org).

## Continuing Medical Education

24 credits of AOA Category 1-A CME are anticipated, all of which are NMM-specific.

## Travel Arrangements

Contact Tina Callahan of Globally Yours Travel at (800) 274-5975 or [globallyyourstravel@cox.net](mailto:globallyyourstravel@cox.net).

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# A Retrospective Review of Osteopathic Care in Pediatric Patients

Kathleen M. Vazzana, OMS IV; Sheldon C. Yao, DO; and Michael John Terzella, DO

## Introduction

### Context

Osteopathic manipulative medicine (OMM) has been used to treat pediatric patients for myriad pathologies. Research has been conducted to assess the effectiveness of OMM in treating patients for infections, respiratory disorders, and musculoskeletal issues.<sup>1-4</sup>

### Objective

To determine the demographics of the pediatric osteopathic patient population by identifying the most common chief complaints, somatic dysfunctions, and treatments.

### Design

A retrospective chart review.

### Subjects

Pediatric patients at the Academic Health Care Center of the New York Institute of Technology College of Osteopathic Medicine who received OMM from January 2008 to August 2013.

### Methods

Using *Current Procedural Terminology* codes for OMM and an age <18 years as search parameters, eClinicalWorks® generated 87 patient charts. Charts from 84 patients met the inclusion criteria. Age, gender, and number of visits were recorded. Chief complaints were classified as musculoskeletal or nonmusculoskeletal. Somatic dysfunction diagnoses were recorded by body region into nine regions: cranial/head, cervical, thoracic, lumbar, sacrum, pelvis, lower extremity, upper extremity, and ribs. OMM techniques used were categorized into nine modalities. Counts, frequencies, and percentages were recorded for each variable.

### Results

The mean age of the patients was 7.93 years. Of the patients whose charts were reviewed, 58 had musculoskeletal and 37 had nonmusculoskeletal chief complaints. The average number of visits was 2.93. Somatic dysfunction frequencies were 60 for the cranial/head region; 71, cervical; 68, thoracic; 45, lumbar; 47, sacral; 35, pelvic; 34, lower extremity; 14, upper extremity; and 67, ribs. The

From the New York Institute of Technology College of Osteopathic Medicine, Old Westbury.

NYIT-IRB No. BHS-972 (August 20, 2013)

*This submission was awarded third place in the students' clinical research category in the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held on March 21 at the AAO Convocation in Colorado Springs, Colorado.*

frequencies for the OMM techniques were 49 for articular; 80, balanced ligamentous tension; 15, counterstrain; 26, facilitated positional release; 14, high-velocity, low-amplitude; 19, lymphatic; 24, muscle energy; 64, myofascial; and 62, cranial.

### Conclusion

Cervical, rib, and cranial/head somatic dysfunctions were the most commonly found dysfunctions in the cohort. Balanced ligamentous tension and myofascial were the most commonly used techniques. High-velocity, low-amplitude was the least-used technique. These findings may guide osteopathic medical students and pediatric health care professionals in assessing and treating pediatric patients. Knowledge about the chief complaints of pediatric patients and knowledge about which OMM techniques have been used to treat patients for those complaints may lead to more use of OMM and more referrals for OMM. Additionally, continuing medical education offerings and research studies should focus on treating pediatric patients for their most common chief complaints.

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*Continued on page 20*

# Logistic Regression Analysis of Factors Influencing 30-Day Readmissions for Diabetic Patients at Tri-City Medical Center

Elizabeth Marie Cummings, OMS III

## Introduction

### Context

The number of patients with type 2 diabetes mellitus who are readmitted to hospitals within 30 days due to diabetes-related illnesses is preventable and costly.

### Objective

This study investigated relationships between social and demographic factors, outpatient treatment compliance, and readmission of patients with type 2 diabetes mellitus to the Tri-City Medical Center (TCMC) in Oceanside, California.

### Methods

Data were analyzed from 268 subjects with diabetes admitted to TCMC in 2011 to assess 30-day readmission rates based on demographic factors such as age, race, and sex and on social factors such as smoking and psychiatric history. In total, 131 subjects were readmitted within 30 days (cohort A), and 137 subjects were not readmitted within 30 days (cohort B). Chi-square analysis results showed equal distribution of subjects per variable between the two cohorts, with sex, race, income, psychiatric history, inpatient visits, and insurance type being statistically significant. Univariate logistic regression was used to analyze the effects of factors on the readmission outcome variable.

### Results

In the univariate logistic regression analysis, the following factors were statistically significant:

- female (OR 0.64 [0.40, 1.04])
- black race (OR 0.25 [0.08, 0.80])
- psychiatric history (OR 2.02 [1.17, 3.48])
- less than \$50,000 in annual income (OR 2.87 [1.00, 8.20])
- insured (OR 2.03 [0.99, 4.16])

From the Touro University Nevada College of Osteopathic Medicine, Henderson.

*This submission tied for first place in the students' public health and education category in the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held on March 21 at the AAO Convocation in Colorado Springs, Colorado.*

Based on the analysis and on a literature review of prior studies, a multivariable logistic regression analysis was conducted. The analysis showed increased odds of readmission for the following:

- Asian race (OR 1.84 [0.61, 5.58])
- non-English-speaking subjects (3.27 [1.21, 8.85])
- subjects who live alone (OR 1.52 [0.76, 3.05])
- less than \$50,000 in annual income (3.41 [1.12, 10.43])
- having insurance (1.50 [0.67, 3.34])
- greater than 2 inpatient visits in the previous 6 months (OR 6.69 [1.99, 22.52])
- greater than 2 outpatient visits in the previous 6 months (OR 1.71 [0.64, 4.52])
- psychiatric history (OR 2.26 [1.20, 4.26]).

### Conclusion

The final predicting logistic regression equation was as follows:

$$\begin{aligned} \text{readmission} = & 0.0136(\text{age}) + 0.4185(\text{living situation}) \\ & + 0.5341(\text{outpatient visits}) + 1.1841(\text{language}) + \\ & -0.4393(\text{sex}) + 1.2265(\text{income}) + -1.6191(\text{black}) + \\ & 0.6114(\text{Asian}) + -0.8842(\text{Hispanic}) + 0.7058(\text{other} \\ & \text{ethnicity}) + 0.4058(\text{insurance}) + 0.8158(\text{psychiatric}) + \\ & 1.9007(\text{inpatient visits}) + -1.3187 \end{aligned}$$

Overall, this study showed that social and demographic factors can predict the readmission of patients with diabetes to TCMC. Increasing outpatient compliance by addressing these social factors could reduce the readmission rates for diabetes patients.





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**Assistant/Associate Professor of Osteopathic Manipulative Medicine**

Marian University College of Osteopathic Medicine (MU-COM) seeks an [Assistant/Associate Professor of Family Medicine](#) and an [Assistant/Associate Professor of Osteopathic Manipulative Medicine](#). Reporting to the Associate Dean of Clinical Affairs, these positions contribute to the education of undergraduate medical students at Marian University.

**Assistant/Associate Professor of Family Medicine** • Ideal candidates must have knowledge of and commitment to the mission of Marian University. The successful candidate must be a DO or MD and have an unrestricted license to practice in Indiana. The candidate must be certified by either the AOA or the ABFM. There must be a strong background in medical education, with an interest in teaching, scholarship and service. Salary and rank will be determined by past experience in academic medicine and practice.

**Assistant/Associate Professor of Osteopathic Manipulative Medicine** • Ideal candidates must have knowledge of and commitment to the mission of Marian University. The successful candidate must be a DO and be AOA-board certified or board-eligible in Neuromusculoskeletal Medicine and Osteopathic Manipulative Medicine (AOBNMM or its equivalent). The successful candidate must also hold a valid license to practice medicine and if not licensed in Indiana, must apply for a license. The most highly desired and preferred candidate will have a strong background in medical education and/or experience in pre-doctoral teaching. Well-developed skills in communication and osteopathic patient care including a wide range of OMT techniques and approaches are essential. There must be a strong interest in teaching, scholarship and service. The Assistant or Associate Professor will lecture and provide hands-on laboratory teaching of osteopathic physicians-in-training at all levels. Responsibilities also include demonstration and explanation of psychomotor skills involved in teaching a wide range of osteopathic manipulative medicine treatment techniques and approaches as well as participation in college of osteopathic medicine committees as assigned or appointed. Academic rank and salary will be commensurate with experience and training.

**About Marian University** • Located within 10 minutes of downtown Indianapolis, Marian University is one of the nation's preeminent Catholic institutions of higher learning, and ranks in the Top 25 of *US News & World Report's* list of Midwest Region colleges, as well as *Money* magazine's list of Top 10 schools in Indiana "For Your Money". Marian University was founded in 1937 by the Sisters of St. Francis, Oldenburg, Indiana, and the Franciscan Values that the Sisters ingrained into the university's culture are still prevalent today. The university has experienced tremendous growth in the past 10 years under the leadership of President Daniel J. Elsener, including the opening of the Marian University College of Osteopathic Medicine in 2013 – the state's first new medical school in 110 years. In 2012, Marian University's football team captured the NAIA national championship in just its sixth year of existence. Marian University is also home to the most successful collegiate cycling program in the nation and currently holds 26 national titles.

For best consideration, submit a CV with a statement of teaching philosophy and research interest as well as three (3) professional references to [hr@marian.edu](mailto:hr@marian.edu). Applications will be received until the position has been filled.

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# Implementation of Osteopathic Pearls Into Arizona College of Osteopathic Medicine (AZCOM) Anatomy 1511 and 1522 Cadaver Lab

**Margaret Hall, PhD; Randall Nydum, PhD; David Shoup, DO; Puanani Hopson, DO;  
Benjamin Kitt, OMS V; and Daniel Mabardy, OMS IV**

## Introduction

The purpose of this 2-year study was to develop a structured and effective means to integrate osteopathic principles into the basic science anatomy course. The foundation of the osteopathic medical profession is a strong anatomical understanding as it relates to disease and health. It was upon this foundation that osteopathic manipulative medicine (OMM) pearls were developed through the collaboration of OMM and anatomy faculty at the Midwestern University/Arizona College of Osteopathic Medicine (MWU/AZCOM). Each OMM pearl is either a clinical osteopathic technique or a principle related to a specific area of dissection. The pearls were presented to first-year medical students at MWU/AZCOM through various media, including dissection binders, introductory lab presentations, and the college's online lecture database (Blackboard), and through personal instruction by the OMM Scholars, the undergraduate teaching fellows at MWU/AZCOM.

## Methods

During the first year of this study, the OMM pearls were correlated to general regions of anatomical dissection, such as "the head and neck." In the second year of this study, an OMM pearl was paired with each specific cadaveric dissection, such as the "suboccipital triangle."

After completing the course, students received a survey that consisted of several questions intended to ascertain the efficacy of the pearls based on the following:

- clarity and appropriateness for students.
- reinforcement of OMM concepts in the anatomy lab.
- facilitation of recall of anatomical concepts during OMM.
- integration of OMM Scholars as instructors of the pearls.

Students answered the questions using a scale from 1 to 5, ranging from strongly disagree to strongly agree. Positive responses were 4 (agree) to 5 (strongly agree).

From the Midwestern University/Arizona College of Osteopathic Medicine, Glendale.

*This submission tied for first place in the students' public health and education category in the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held on March 21 at the AAO Convocation in Colorado Springs, Colorado.*

## Results

Greater than 51% of respondents to both surveys responded positively regarding clarity and appropriateness for students. Survey questions that assessed recall of anatomy and OMM generated positive responses from 59% and 63%, respectively, of those surveyed in the first year of the study, while in the second year of the study, the positive responses decreased to 45% and 32%, respectively. Greater than 53% of the respondents agreed that the Scholars were a positive influence in the anatomy lab.

## Conclusion

This study illustrated successful integration of osteopathic pearls in an anatomy course, and it highlighted areas of potential improvement. The results of this study indicate that collaboration between anatomy and OMM departments and integration of osteopathic principles are dynamic-yet-necessary processes. Although initially taught in conjunction with each other, basic sciences and osteopathic principles became separate disciplines as osteopathic medical education evolved. This study demonstrates a unique strategy to meld these inseparable fields of study.

# Changing Health Behaviors in First-Year Medical Students: A Pre- and Post-Analysis

Michael L. Smith, PhD; Kim Fulda, DrPH; Chelsea Stone, MA, OMS III;  
and Randall H. Trammell, OMS III

## Introduction

First-year medical students begin their classroom studies with ideals of providing health care while exemplifying the healthy habits they wish to impart to their patients. The reality is that this high-pressure educational environment followed by 3 to 8 years of graduate medical education has great potential to lead students down the path of poor health behavior. Plentiful research supports that a correlation exists between high-stress situations and declining self-care behavior. Academic challenges combined with new and unfamiliar surroundings place first-year medical students under high stress, and some students look for new ways to cope with the strain. A current cause of concern is the surge in energy drink consumption among first-year medical students. Therefore, the purpose of this study is to evaluate first-year medical students' health habits, their perceptions of stress, and the relationship between their stress and their consumption of energy drinks.

## Methodology

This study involved administering two surveys to the incoming class of the UNT Health Science Center Texas College of Osteopathic Medicine. The presemester survey, which was distributed during orientation week, was completed by 221 first-year medical students. The principal investigator recruited subjects with a brief oral speech. Subjects were informed that their participation was completely voluntary and that deciding not to participate would not have a negative impact. Near the conclusion of the first semester, a postsemester survey was completed by 123 students in the first-year class.

Analyses were done only on those subjects who completed both surveys ( $n=123$ ). The subject pool consisted of 58 male students and 65 female students, ranging in age from 21 to 41 with a mean age of 24 and a standard deviation of 2.969. A dependent sample  $t$ -test was used to compare the Perceived Stress Scale between the initial and secondary surveys. Nonparametric McNemar tests were used to compare presemester and postsemester average hours of sleep in a 24-hour period and average days per week that subjects exercised. Nonparametric McNemar tests were also used to compare whether subjects consumed energy drinks within the previous month. A  $p$ -score of less than .05 was considered significant.

From the UNT Health Science Center  
Texas College of Osteopathic Medicine, Fort Worth.

*This submission was awarded second place in the students' public health and education category in the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held on March 21 at the AAO Convocation in Colorado Springs, Colorado.*

## Results

The dependent sample  $t$ -test indicated that the mean score on the Perceived Stress Scale increased from 12.8862 (SD=5.813 and range of 26) on the initial survey to 18.1782 (SD=6.504 and range of 38) on the second survey. The increase in mean score correlated with an increased level of perceived stress on the postsemester test as compared with the presemester test. The  $p$ -value for this variable was less than .05.

## Sleep

A nonparametric-related sample McNemar test and a frequency analysis were used to compare the average number of hours of sleep the subjects obtained in a typical 24-hour period. Results of the presemester survey indicated that in a 24-hour period, 26.8% of the subject pool slept 5 to 6 hours, 71.5% slept 7 to 8 hours, and 1.6% slept more than 9 hours. The postsemester test indicated a significant decrease in sleep, with 2.4% of the subject pool sleeping 3 to 4 hours, 51.2% sleeping 5 to 6 hours, 45.5% sleeping 7 to 8 hours, and 0.8% sleeping more than 9 hours. The  $p$ -value for the sleep variable was less than .05.

## Exercise

A nonparametric-related sample McNemar test and a frequency analysis were used to compare the number of days per week the subjects reported exercising in the previous month. On the presemester test, 36.9% reported exercising 2 or fewer days per week; 44.3%, 3 to 4 times per week; 16.4%, 5 to 6 times per week; and 2.5%, 7 days per week. The days per week that subjects

*Continued on page 34*

# The Relationship of Alzheimer Disease to Human Prion Diseases Through Shared Biochemistry and Pathology

Jeanna Del Vecchio West-Miles, OMS IV

## Abstract

### Objective

To determine the extent of the biochemical or pathological relationship between Alzheimer disease and human prion diseases. To propose and provide evidence for the hypothesis that Alzheimer disease is a human prion disease variant and, therefore, infectious.

### Data Sources

- Science Direct
- JSTOR
- PubMed
- EBSCO Host
- Acta Neurologica
- National Academy of Sciences
- Taylor Hooper
- University of Oxford Library
- Colorado College Library

### Study Selection

Journals were searched via online databases using the keywords *prion*, *Alzheimer disease*, *lipid raft*, *infectious encephalopathy*, *Alzheimer disease*, and *Alzheimer and prions*. Various journals in biochemistry, neuroscience, biology, infectious disease, and genetics were reviewed and searched for relevant studies. Researchers in the field were contacted directly via e-mail.

### Data Extraction

Relevant abstracts were read and sorted. Information was organized, and full-text articles were read and annotated. Studies were included

From the Rocky Vista University College of Osteopathic Medicine, Parker, Colorado

*This submission was awarded third place in the students' public health and education category in the Louisa Burns Osteopathic Research Committee's 2014 poster presentation, which was held on March 21 at the AAO Convocation in Colorado Springs, Colorado.*

based on relevance to the objective, quality of sources, research design, and peer review.

### Data Synthesis

A systematic literature review of 37 selected articles was generated and reviewed by members of Colorado College's Neuroscience Department. Final review was performed by Kristi Erdal, PhD.

### Conclusions

The theoretical mechanism for neurologic deterioration in Alzheimer disease shares several profound biochemical and pathologic similarities to the pathogenesis of human prion diseases. The neurodegenerative processes of Alzheimer disease and human prion diseases are identical, given current data. There is sufficient research to support the proposal to include Alzheimer disease among human prion diseases and, therefore, significant concern that Alzheimer disease may be infectious, as are human prion diseases.

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### Osteopathic Care in Pediatric Patients (Continued from page 15)

3. Degenhardt BE, Kuchera ML. Osteopathic evaluation and manipulative treatment in reducing the morbidity of otitis media: a pilot study. *J Am Osteopath Assoc.* 2006.;106(6):327-334.
4. Mills MV, Henley CE, Barnes LL, et al. The use of osteopathic manipulative treatment as adjuvant therapy in children with recurrent acute otitis media. *Arch Pediatr Adolesc Med.* 2003;157(9):861-866.



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## Program Chair

**Bruno J. Chikly, MD, DO (UK) (Hon), PhD**, is a graduate of the medical school at St. Antoine Hospital in Paris, France. Dr. Chikly also has the French equivalent of a master's degree in psychology. He received an honorary DO degree from the European School of Osteopathy in Maidstone, Kent, in the United Kingdom and a PhD in osteopathy from the Royal University Libre of Brussels in Belgium. He is the author of the book *Silent Waves: The Theory and Practice of Lymph Drainage Therapy*, as well as the creator of a DVD titled *Dissection of the Brain and Spinal Cord*.



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## Assistant/Associate Professor, Osteopathic Medicine



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- Facilitate collegial OMM integration within the University departments and colleges
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- Participate in the Undergraduate OMM Fellows program
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email: [mitchell.hiserote@tu.edu](mailto:mitchell.hiserote@tu.edu)

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Subject: Your Name, Assistant/Associate Professor OMM or  
Mail: Touro University California  
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# Using the Strain-Counterstrain Approach to Highlight the Body Unity Within Osteopathic Treatment

Antoine Dixneuf, DO (France), and Badih Ghattas, MS, PhD

## Abstract

### Context

Body unity is one of the fundamental principles in osteopathy training and practice. Is it just a dogma or a reality?

### Methods

Data were collected for one year during patient consultations based on a test protocol. For each patient, complaints, strain-counterstrain tender points before and after adjustment, and other variables have been registered. A statistical analysis of the data was conducted to highlight conditional correlations between tender point complaints and adjustment by anatomic zones.

### Results

Tender points and adjustment analysis did not show a direct correlation between complaints and adjustment locations. At the beginning of each consultation, an average of 23 tender points appeared. Whatever the complaints, tender points were distributed on average as follows: 4-5 for cervical; 4 for the pelvis; 3 for the skull; and 2 each for lumbar, thoracic, and shoulder; 1 for the foot, knee and ribs; and less than 1 for the hand, hip and elbow. On average, 5 adjustments were made, corresponding to 20% of the initial tender points. After the first adjustment, the average number of tender points decreased to 8 for all the body zones concerned.

### Conclusions

The tender points' evolution confirms the unity of the body and thus the need for global treatments. This study highlighted the existence of compensations and shows that pain is not a direct result of the zone in which somatic dysfunction occurs.

### Introduction

According to the consensus declaration of 1953 from what is now the A.T. Still University–Kirksville College of Osteopathic Medicine in Missouri, one of the four major principles of osteopathic medicine is “[t]he body is a unit.”<sup>1</sup> In 2002, another consensus group proposed that this principle be amended as follows to include the psychological and intellectual dimension of the human being: “A person is the product of dynamic interaction between body, mind,

From the Aix-Marseille University, Mathematical Institute of Luminy in France.

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*Disclaimer:* This article uses both the terms *osteopathic manipulative therapy (OMTh)* and *osteopathic manipulative treatment (OMT)*. *OMTh* refers to manipulation provided by international osteopaths, while *OMT* refers to manipulation provided by US-trained osteopathic physicians.

and spirit.”<sup>2</sup> According to Evans, “The 1953 authors defined ‘the body’ rather ‘the person’ as the unit of totality, clearly excluding the mind from that unit.”<sup>3</sup>

The principle of unity of body, mind, and spirit is essential in osteopathic education and remains fundamental to patient care. Yet is it truly observed and incorporated by those practicing osteopathic medicine and osteopathy?

Except for studies focused on teaching or osteopathic principles, osteopathic research can be listed in two categories: The first category consists of research on the techniques used for local

*Continued on page 24*

*Continued from page 23*

treatments and their effectiveness on local symptoms.<sup>4-7,9</sup> The second compares the efficacy of osteopathic manipulative treatment or osteopathic manipulative therapy (OMTh) with other healing methods without accounting for the osteopathic techniques used.<sup>15,16,17</sup>

To the authors' knowledge, none of these published studies evaluates or focuses on the body unit. Is this deficiency due to study constraints, or does it reflect widespread practice? Should we consider this principle as a dogma or as reality? It seems necessary to highlight the body unity of the human being in our research to preserve the identity of osteopathy.<sup>8</sup>

This article aims to highlight the unity of the body using a protocol of tests and adjustments based on strain-counterstrain techniques. Data were collected in an osteopathic office, and the protocol was based on the consultations that took place in that office. In this way, most of the office's patients and complaints could be included in the sample.

To showcase and prop up the body unit principle on which osteopathy is based, we will also try to answer the following questions:

- Is there a link between patient complaints and somatic dysfunction?
- Is there a link between complaints and adjustments?
- Could we standardize osteopathic treatments according to the complaints?
- What are the local and general effects of adjustment? Are they neurological, mechanical, etc.?

## Methods

### Patients

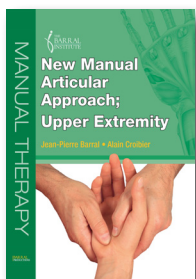
Because this pilot study was conducted at an osteopathic office, all patients could participate. However, the following subjects were excluded:

- patients unable to verbalize or evaluate the pain intensity of the tender points.
- patients with local pain due to a traumatic injury, such as a recent and inflammatory sprain.

*Continued on page 25*



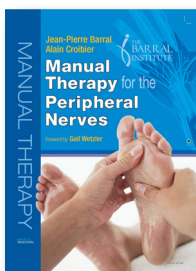
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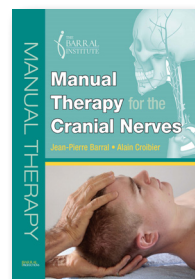
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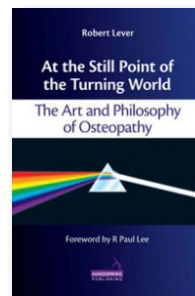
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*Continued from page 24*

- patients who were frequently tardy for appointments.

Data were collected for one year, from July 2012 to July 2013, so that a significant number of patients could participate.

The pilot study included 443 men and 564 women.

**Why strain-counterstrain techniques?**

Strain-counterstrain (SCS) allows for the following:

- a complete evaluation of the body.
- impartial tests and adjustments through the patient's pain evaluation<sup>10</sup> in correlation with the provider's palpation.
- easy transcription of clinical information into binary code: Tender points (TPs), for example, are either positive or negative.

**Protocol**

The patient sessions included the following stages:

- The patient case history and reason for the consultation were gathered. A maximum of five complaints were recorded for each patient.
- Following palpation to map the locations of TPs, patients were treated first for the most sensitive TPs located on their trunks or skulls and then for TPs in their extremities, per SCS<sup>10</sup> protocol.
- After the first adjustment, each patient's entire body was checked again, and the most severe TP was corrected.
- The first two steps were repeated until no sensitive TPs were found.

Sessions lasted approximately 45 minutes.

**Data**

Two types of data were collected during the visit:

- The following socioepidemiological data were collected at the beginning of each session: age, sex, profession, laterality, date of last osteopathic visit, primary reason for the most recent consultation, and a nonordered list of 5 complaints.
- Osteopathic data were collected during tests and adjustments. Cervical rotation was noted at the beginning of each visit, and data on 42 TPs covering the entire body and classified into four segments were collected and denoted as *tender points A (TPAs)*. Among the TPAs, 18 correspond to the trunk area segment, 8 to the skull segment, 8 to the upper extremity segment, and 8 to the lower extremity segment. The first adjustment was noted as *A1*. After the first adjustment, data were collected on 12 TPs, and those TPs were denoted as *tender points B (TPBs)*. The

process was repeated, with the total number of adjustments limited to 8, which were denoted as *A1 to A8*. Tender points were not registered after *A2*.

For a month prior to data collection, experiments on 40 patients helped to identify the maximum number of TPs in each body part. These experiments determined the number of TPs diagnosed at each stage of the protocol.

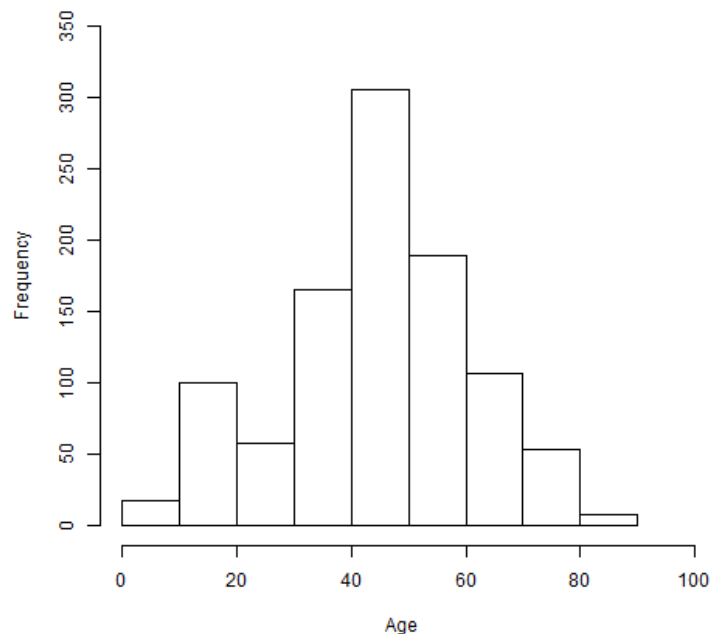
Diversity of complaints and number of TPs mapped in SCS (2x200) techniques required preprocessing and some coding procedures for the data prior to conducting the statistical analysis. Complaints were classified into 20 categories corresponding to anatomical zones or areas of influence, namely hands, visceral, skull, feet, hips, psychological, pelvis, shoulders, cervical, spine, thorax, elbow, thigh, dorsal, knees, legs, lumbar, limbs, wrist, and general health. Another category was established for complaints that were part of regular checkups.

Tender points and adjustments were classified into 12 categories corresponding to different anatomical zones, namely pelvic, cervical, ribs, elbows, skull, thoracic, shoulders, knees, hips, lumbar, hands, and feet.

**Results**

The socioepidemiological data and the osteopathic data were analyzed separately. For the osteopathic data, the results concern the

**Figure 1.** Age distribution of the study sample.



*Continued on page 26*

*Continued from page 25*

initial TPs, the A1, and the TPs remaining after A1. We also tried to correlate the difference between TPA and TPB with A1.

### Socioepidemiological data

Of the 1007 subjects, 564 (56%) were women, and 443 (44%) were men. This 12% difference supports studies showing that women are less tolerant of pain than men.<sup>13,14</sup>

The incidence of left-handedness was 9.5% (96 subjects), which matches the usual observed proportion.<sup>11</sup>

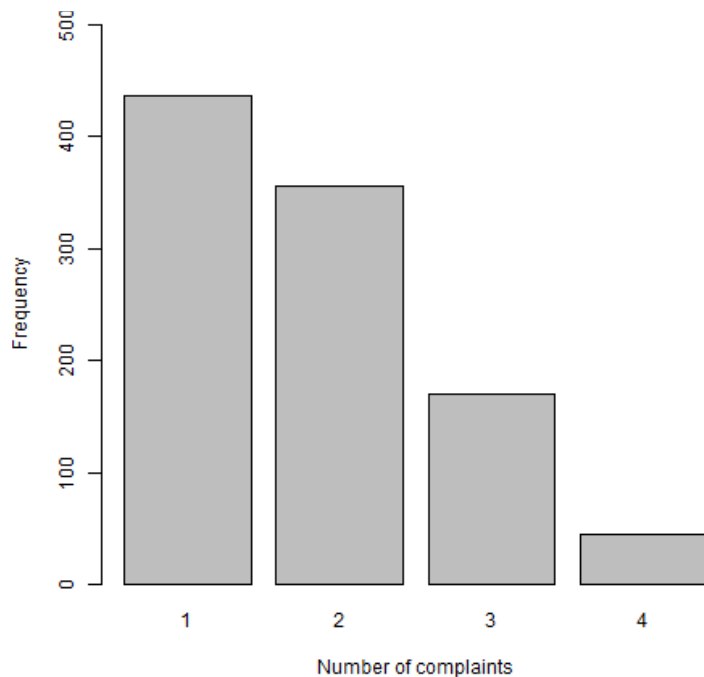
Finally, the age distribution of the sample (*Figure 1, page 25*) for this study is quite similar to that of the French population. However, the 0-10 age category was underrepresented in this study because patients were excluded if they were unable to verbalize or evaluate the pain intensity of TPs.

### Complaints analysis

The complaints analysis (*Figure 2*) shows that almost half of the population seeks osteopathic consultations for more than 1 motive: Subjects had 2 to 4 various complaints, but only a few subjects had 5 complaints.

The distribution of the individual complaints (*Figure 3*) shows a predominance of complaints in the lumbar region,<sup>6,12</sup> followed by the cervical,<sup>6</sup> thoracic, and shoulder areas.

**Figure 2.** Distribution of number of complaints.



Complaints that were less frequent but remained significant motives for seeking consultations were about knees, the skull, the pelvis, feet, psychological, and hips.

Among the 45% of the patients who had more than one complaint, the most frequent combinations were cervical-lumbar, thoracic-lumbar, cervical-thoracic, and shoulder-lumbar. These four combinations accounted for the complaints of 10% of the patients, and they represent 25% of the combinations.

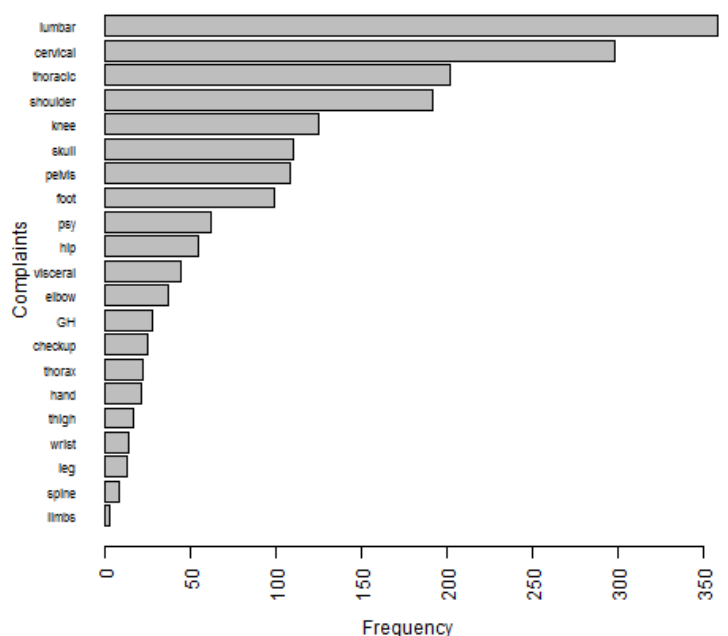
### Osteopathic data

Tender points before and after adjustment were analyzed, and they were correlated globally and by influence zone. The differences between the frequencies of TPs were correlated to complaints.

### Analysis of the initial tender points

*Figure 4* on page 27 shows the distribution of the number of TPAs per patient, and *Figure 5* on the same page shows the spread of these TPAs. Of the patients treated, 75% had 15 to 30 TPAs, and 29.8% had between 20 and 25 TPAs. TPAs were concentrated in the cervical zone (5 on average per patient), the pelvis (4.25) and the skull (3). The other TPAs were spread throughout the rest of the body, with an average of 2 TPAs each in the lumbar, thoracic, and shoulder areas.

**Figure 3.** Location of complaints.



*Continued on page 26*

Figure 4. Histogram of number of TPAs.

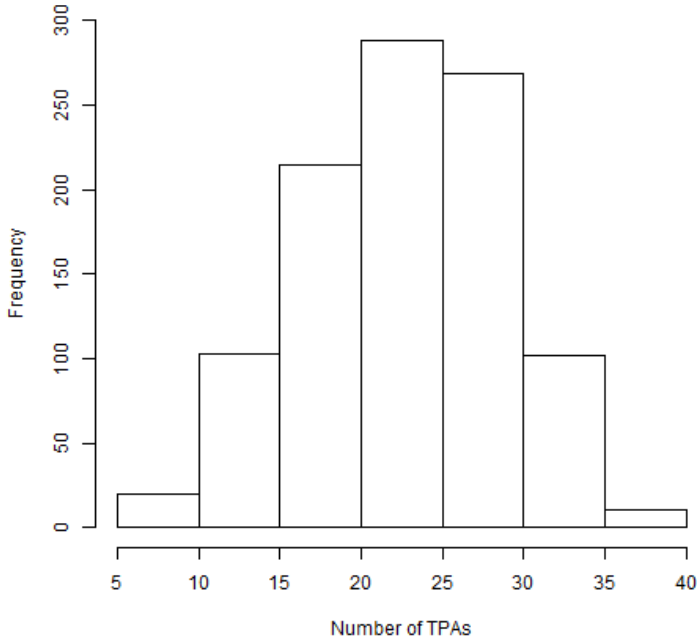


Figure 5. Average number of TPAs per anatomic zone.

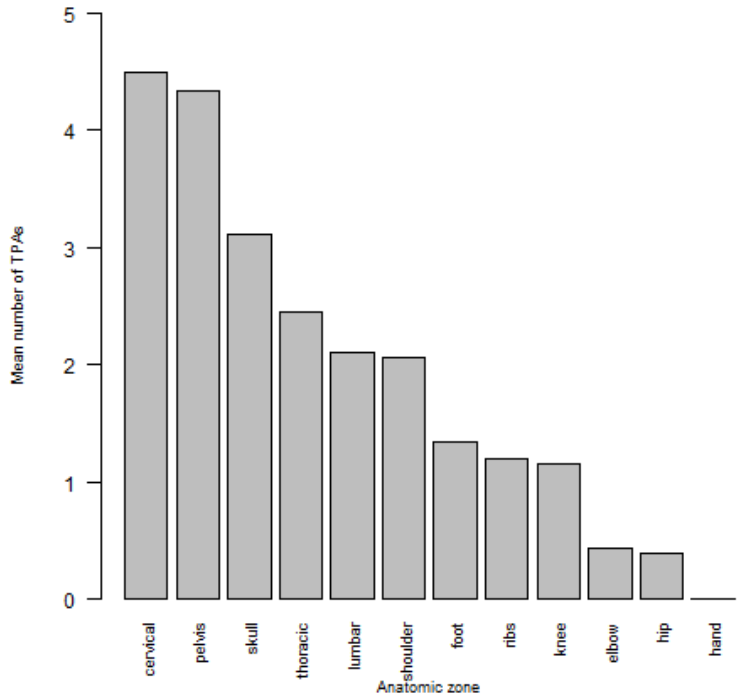


Figure 6. Box plot of number of TPAs by sex.

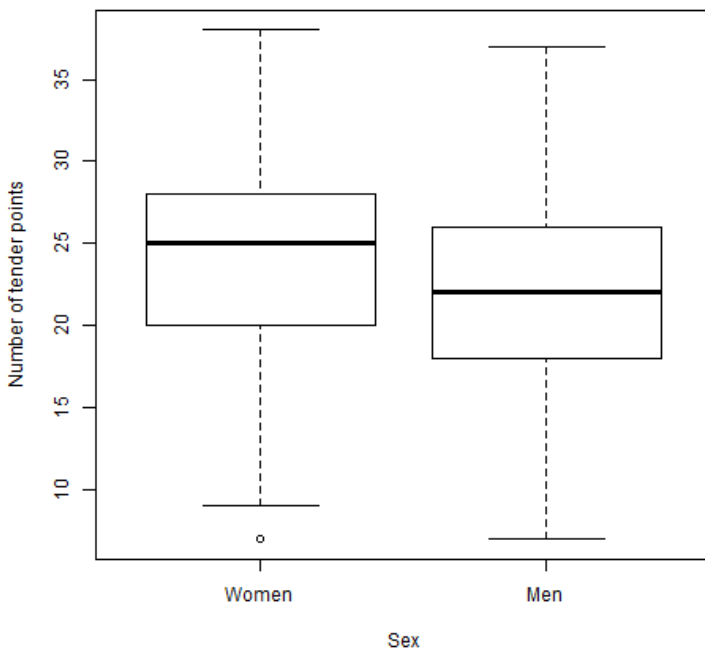
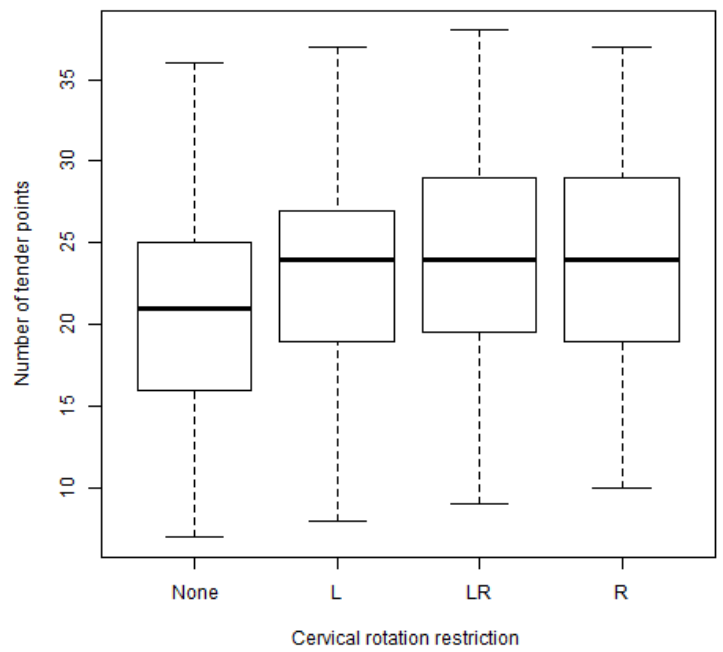


Figure 7. Box plot of number of TPAs for each type of cervical rotation restriction.



*Continued from page 26*

Figure 6 on page 27 shows a significant difference in the number of TPs between men and women. The average number of TPs for women is 24.07 compared with 21.81 for men. A *t*-test comparing the number of TPs within the two groups gives a *p* value equal to 1.7e-09, rejecting the null hypothesis of equal means.

The data show that women had an average of 2 TPs more than men. This gap supports other research that has found a difference between men and women with regard to pain tolerance.<sup>13,14</sup>

The observed distribution of cervical rotation restrictions was 52.63% for left restriction (L), 14.1% for right restriction (R), and 18.27% for bilateral restriction (LR). Cervical rotation restriction (Figure 7, page 27) was associated with an elevated number of TPs: On average, patients with R or LR restriction had more TPs than patients with L restriction.

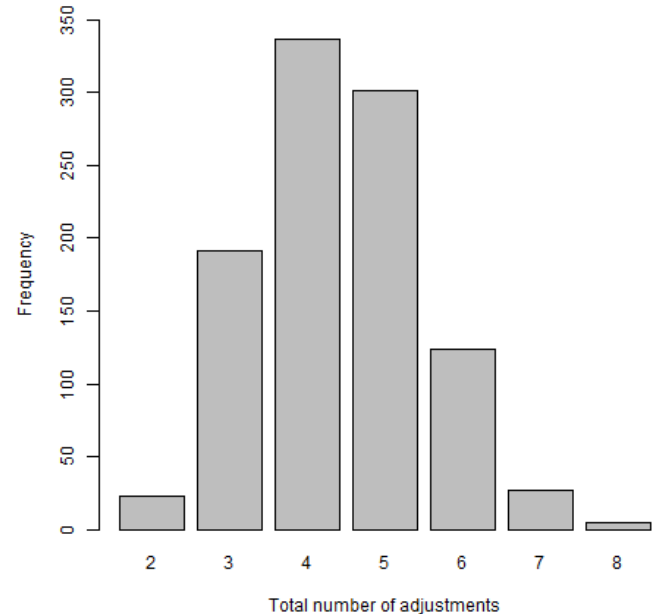
The observed mean number of TPs was 20.67 for patients having no restriction, 23.77 for those with R restriction, 23.18 for those with L restriction, and 24.22 for those with LR restrictions. The analysis of variance comparing the number of TPs in the four groups gives a *p* value of 2.7e-07, also rejecting the null hypothesis of equal mean for number of TPs.

The analysis of the TPAs shows that although left-handed subjects had only one more TP on average than right-handed subjects (R:22.99, L:24.08), the difference is statistically significant (*p*=0.03).

### Initial tender points and complaints

Table 1 below shows how TPs are distributed through the body, both separately based on the most frequent complaint combinations and globally. Tender points occurred most frequently in the cervical

**Figure 8.** Histogram of number of adjustments



**Table 1.** Distribution (as a percentage) of initial tender points within the body according to the most frequent complaint combinations and globally.

	Shoulder	Lumbar	Knee	Cervical	Hip	Skull	Thoracic	Ribs	Foot	Pelvis	Elbow
<b>Pelvis</b>	7.1	10.0	4.7	20.0	2.4	14.0	10.0	5.2	4.7	20.0	1.5
<b>GH</b>	6.5	8.4	2.7	21.0	2.0	14.0	12.0	4.5	5.7	21.0	2.0
<b>Cervical</b>	8.6	7.2	4.8	22.0	1.1	14.0	11.0	5.7	5.8	18.0	1.7
<b>Cervical-thoracic</b>	5.3	8.6	4.2	22.0	1.2	13.0	13.0	5.1	5.6	21.0	1.4
<b>Cervical-thoracic-lumbar</b>	8.4	11.0	3.3	21.0	1.8	14.0	12.0	4.3	4.1	18.0	2.3
<b>Cervical-lumbar</b>	8.9	9.3	4.8	21.0	1.9	13.0	10.0	5.1	4.4	19.0	1.6
<b>Skull</b>	5.4	7.6	4.8	23.0	1.6	19.0	12.0	4.4	4.4	17.0	0.32
<b>Thoracic</b>	10.0	8.0	5.1	18.0	1.9	13.0	10.0	6.5	5.2	21.0	1.2
<b>Thoracic-lumbar</b>	8.2	9.5	4.5	22.0	1.7	13.0	11.0	5.2	5.5	18.0	0.92
<b>Shoulder</b>	17.0	7.3	3.6	19.0	1.2	13.0	9.6	6.3	5.0	15.0	3.0
<b>Shoulder-lumbar</b>	11.0	10.0	3.3	17.0	0.7	13.0	11.0	5.7	5.2	21.0	2.1
<b>Knee</b>	7.0	10.0	9.1	18.0	2.5	11.0	8.6	5.0	7.5	20.0	1.3
<b>Lumbar</b>	6.3	12.0	5.1	18.0	1.8	13.0	10.0	4.7	4.7	22.0	1.5
<b>Foot</b>	5.9	8.8	5.0	17.0	2.0	14.0	9.6	3.1	15.0	20.0	0.88
<b>Global</b>	8.9	9.1	5.0	19.0	1.7	13.0	11.0	5.2	5.8	19.0	1.9

*Continued on page 29*

*Continued from page 28*

area (19%), the pelvic area (19%), and the skull (13%), followed by the thoracic area (11%), lumbar area (9.1%), and shoulders (8.9%).

Considering the distribution of TPAs by complaint, we can see that more TPs appear in general within the zone associated to patients' complaints. A chi-square test comparing complaint combinations and TPA zones rejects the null hypothesis that these two factors are independent of each other ( $p=2.2e-16$ ). In this analysis, complaint

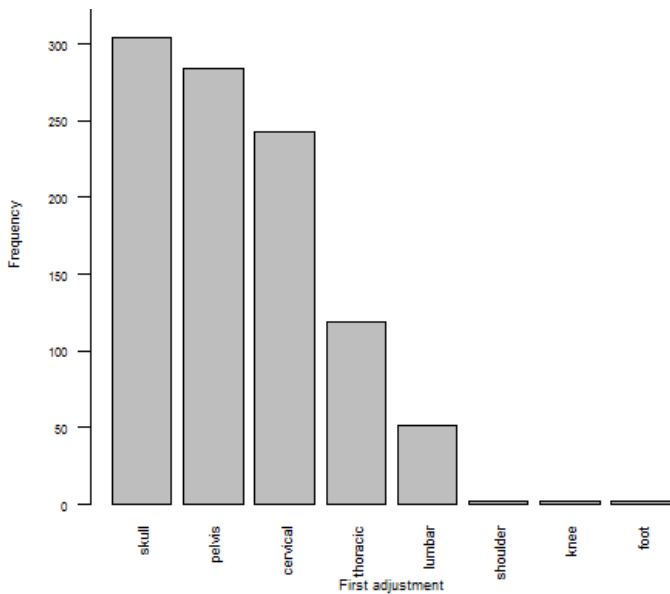
combinations were included if they were made more than 15 times, and TPs related to the hands were omitted because they are rare.

### Adjustment analysis

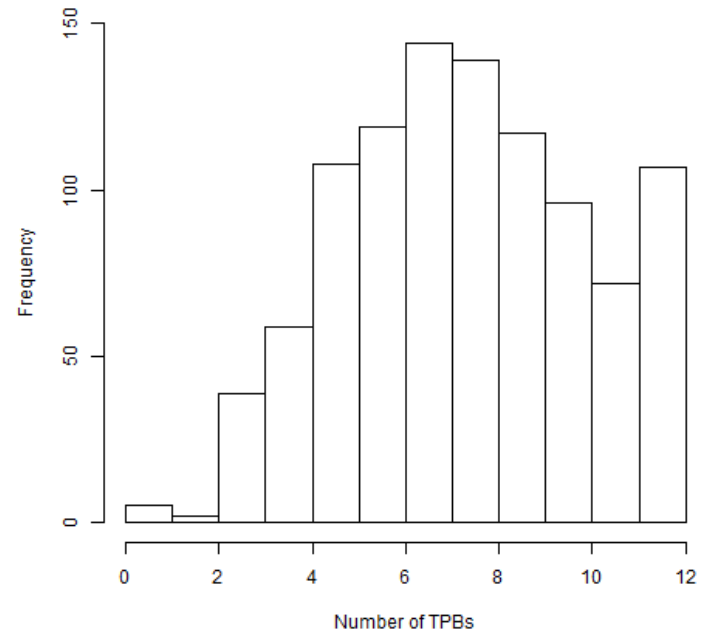
The number of adjustments varied from 2 to 8, but they ranged between 4 and 5 for 60% of the patients (*Figure 8, page 28*).

*Figure 9* below shows how the A1s were distributed within the body. The skull (29%), pelvis zone (27%) and cervical zone (25%) greatly

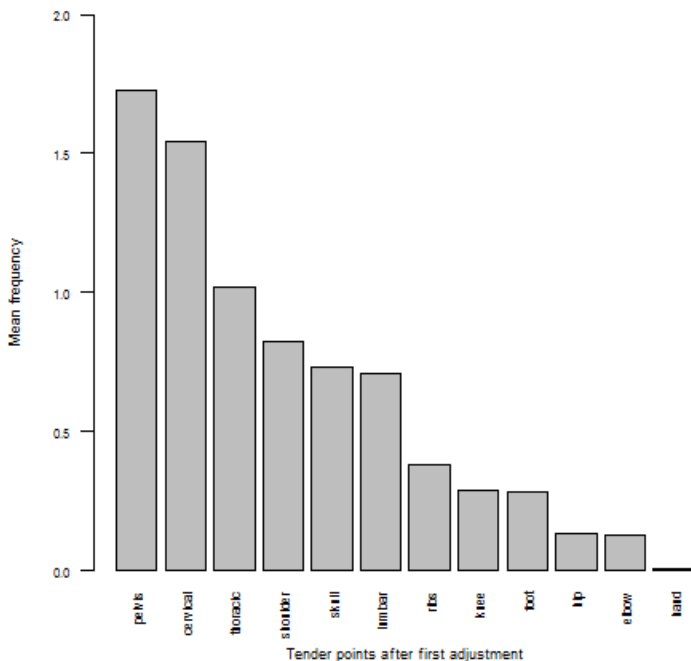
**Figure 9.** Distribution of the first adjustment.



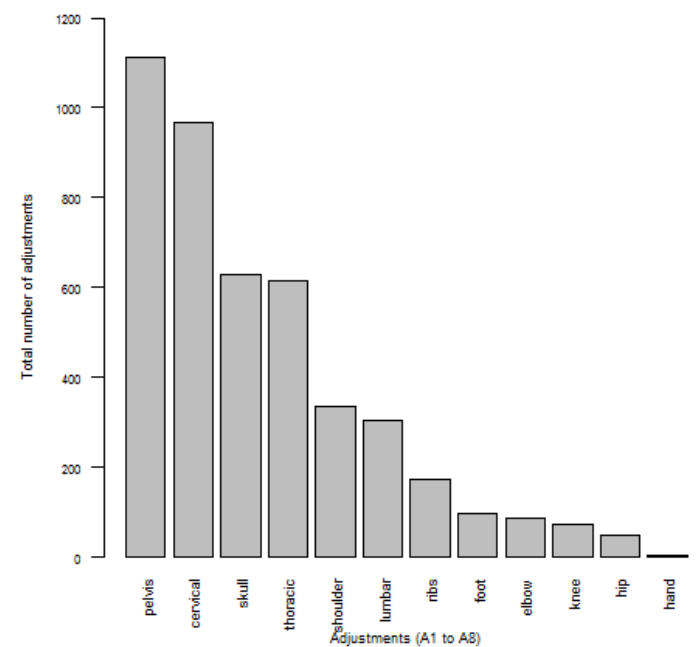
**Figure 10.** Histogram of the number of tender points remaining after first adjustment.



**Figure 11.** Average frequency of tender points B per anatomic area.



**Figure 12.** Total number of adjustments per anatomic zone.



*Continued on page 30*



*Continued from page 29*

outnumbering the thoracic zone (12%) and lumbar zone (5%). According to the study's protocol, the A1 was chosen so that it corresponded to the most painful TP, which was situated in the skull or the trunk.

**Tender points after the first adjustment**

After the A1, the number of TPs decreased, ranging between 2 and 8 (Figure 8) compared with between 5 and 40 per patient initially (Figure 4). In 60% of the cases, the number of TPBs was between 4 and 9, and for 25% of cases, TPBs ranged between 9 and 12 (Figure 10).

The distribution of TPBs (Figure 11, page 29) throughout the body resembled the distribution observed for TPAs (Figure 5). In

addition, the distribution of both TPAs and TPBs were similar to that of the 8 adjustments throughout the body (Figure 12, page 29). Pelvic and cervical zones were predominant.

Interestingly, there was a lack of correlation between location of complaints (Figure 3) and the location of the most frequent TPAs and TPBs (Figures 5 and 11). Although complaints about the lumbar region were the most frequent, lumbar TPAs ranked fifth and sixth in frequency. Pelvic TPAs were extremely frequent, but the corresponding complaints were ranked seventh (Figure 3). Only the cervical zone ranked the same for TPAs and complaints.

**Correlations between complaints and first adjustments**

Figure 3 demonstrates that no correlation exists between location of complaints and A1. In fact, although the lumbar zone represented

**Table 2.** Distribution of first adjustments for the most frequent complaints (more than 20).

<b>Complaints \ A1</b>	<b>Pelvis</b>	<b>Cervical</b>	<b>Skull</b>	<b>Thoracic</b>	<b>Lumbar</b>	<b>Shoulder</b>	<b>Knee</b>	<b>Foot</b>
<b>Pelvis</b>	15	10	9	2	2	0	0	0
<b>Checkup</b>	9	3	5	2	1	0	0	0
<b>Cervical</b>	20	12	17	10	0	0	0	0
<b>Cervical-thoracic</b>	7	6	5	2	0	0	0	0
<b>Cervical-thoracic-lumbar</b>	5	4	6	2	0	0	0	0
<b>Cervical-lumbar</b>	8	9	14	3	3	0	0	0
<b>Skull</b>	2	3	9	1	0	0	0	0
<b>Thoracic</b>	8	10	11	4	1	0	0	0
<b>Thoracic-lumbar</b>	5	9	9	4	1	0	0	0
<b>Shoulder</b>	12	12	15	3	1	2	0	0
<b>Shoulder-lumbar</b>	3	2	7	3	3	0	0	0
<b>Knee</b>	11	7	6	1	2	0	0	0
<b>Lumbar</b>	48	25	29	9	6	0	0	0
<b>Foot</b>	5	7	6	1	2	0	1	0

**Table 3.** Relative decrease (as a percentage) of the number of tender points for each adjustment and for each zone of the body.

<b>TPs \ A1</b>	<b>Pelvis</b>	<b>Cervical</b>	<b>Skull</b>	<b>Thoracic</b>	<b>Lumbar</b>	<b>Shoulder</b>	<b>Foot</b>	<b>Ribs</b>	<b>Knee</b>	<b>Elbow</b>	<b>Hip</b>
<b>Pelvis</b>	70.7	54.7	64.5	58.5	65.6	61.3	78.0	71.5	78.9	72.6	64.6
<b>Cervical</b>	55.5	78.5	82.3	53.3	65.6	55.1	82.8	68.6	75.8	69.1	69.1
<b>Skull</b>	53.3	67.9	85.8	55.4	63.5	63.0	75.5	72.1	73.2	69.4	64.4
<b>Thoracic</b>	57.2	59.9	67.6	75.5	70.7	68.6	78.4	77.1	75.0	74.5	65.1
<b>Lumbar</b>	65.0	60.6	70.0	53.9	83.0	63.1	83.8	69.6	75.9	68.8	68.0

*Continued on page 31*

## *Continued from page 30*

20% of complaints (*Figure 3*), it represented only 7% of patients (*Figure 12*). The pelvic zone was less of a source of complaints (6%) but was more frequently adjusted (25%).

*Table 2* on page 30 compares the distribution of A1s throughout the body to the most frequent complaints. That table shows, for example, that 41% of the A1s for lumbar complaints occurred in the pelvis, 25% in the skull, 21% in the cervical zone, 7% in thoracic zone, and only 5% in the lumbar region.

### **Influence zone of first adjustment**

The goal of this analysis was to determine whether OMTh has global action. To do so, this study measured the influence of an adjustment on the rest of the body.

*Table 3* on page 30 gives for each adjustment the relative proportion of TPs that disappeared in each zone of the body. Rare adjustments were excluded, as were TPs relative to the hands.

The data in that table indicate that A1 decreases at least 50% of the TPAs, demonstrating that A1 influences the whole body.

This decrease is even greater for the TPs corresponding to the zone of adjustment. However, high values for zones having few TPAs, such as feet, ribs, knees, elbows, and hips, should be considered with caution.

### **Comment**

The study sample verified several known characteristics, such as sex distribution, location of complaints, and proportions of left- and right-handedness. The effect of these factors, as well as that of cervical limitation, is statistically significant for the number of TPs.

### **Not all tender points are somatic dysfunction**

*Table 3* shows a significant decrease of TPs (60%) after A1.

This drastic decrease suggests two types of TPs: those that need adjustments that correspond to somatic dysfunction and those that disappear after adjustment—the compensations. On average, 25 TPs were observed for each patient, and 4-5 of them were adjusted (*Figure 8*), which represented less than 20%. These TPs corresponded to somatic dysfunction, while the remaining 80% corresponded to compensations.

### **Tender points are not located where the complaints are**

The A1s in our protocol did not depend on the complaint zone. Indeed, for any complaint, the observed TPs were not all localized in the same zone as the complaint, demonstrating the necessity

of considering the body globally and of avoiding symptomatic or standardized treatment.

The fact that the distribution of TPs differed from the location of patients' complaints raises the following question: Is the pain due to somatic dysfunction or to compensation to somatic dysfunction? The analysis in *Figure 12* may offer a partial answer.

Somatic dysfunction and, equivalently, adjustments are not necessarily located in the complaint zone. Jones advanced that idea when he noted<sup>10</sup>: "Areas of pain complaint are often not where treatment is initiated" and "My patients didn't complain of front pain, just back pain.... I needed a tender point and did find them all! The missing half of tender points are on the front of the body."

### **Analysis of areas of influence of the first adjustment confirms body unity**

The body globally reacts by compensating to somatic dysfunction in any zone in the body but mostly in the skull, pelvis, and cervical region. Fewer compensations are located in the limbs.

Some neurophysiological experiments demonstrate this unity. Vibrations applied on muscles<sup>20,21</sup> create a lure in the proprioceptive system. Courtine observed, "It is worth stressing that, for all stimulated muscles, the effects of vibration were not local, ie, restricted to responses at the stimulated joint, but instead involved global reactions that changed whole body orientation relative to gravity...."<sup>18</sup>

*Table 3* demonstrates that the levels of influence of each adjustment are quite similar. An adjustment globally modifies posture. Whenever adaptations instantly and entirely disappear from the body when somatic dysfunction is corrected, the "body unit" is confirmed.

### **Wholeness of osteopathic manipulative therapy is formulated via the proprioceptive system**

The statistical analysis of this study supports the principle of body unity. On one hand, the study shows that the locations of complaints are independent of tender point distribution. On the other hand, the study shows that adjustments affect multiple zones simultaneously.

An important question is how are the different zones of the body linked? In this study, the authors used strain-counterstrain techniques, so the answer to that question refers to the effects of SCS.

*Continued on page 33*

# PRE-CONVOCATION COURSE: FDM OF THE AXIAL SPINE—MODULE 2

March 8-10, 2015 • Kentucky International Convention Center in Louisville

## Course Description

The fascial distortion model (FDM), an anatomical perspective developed by the late Stephen P. Typaldos, DO, addresses musculoskeletal injury by identifying and treating fascial distortions. According to the model, six distortions are responsible for most musculoskeletal injuries and pain. Correcting these distortions restores biotensegrity and symmetrical motion. The FDM provides health care professionals with insight into fascial function and relieving patients' pain.

Course participants will be instructed in body language and verbal cues that describe pain caused by fascial distortions, and they will learn how to resolve those distortions. This course will focus on applying FDM to treat the axial spine. The course will have separate sections on the cervical spine, thoracic spine, lumbar spine, sacrum and pelvis, and it will cover inversion treatments based on the FDM.

Completion of the first FDM module is not required.

## Course Location

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## Program Chair

The medical director of the Tanana Valley Clinic in Fairbanks, Alaska, **Todd A. Capistrant, DO, MHA**, earned both his doctor of osteopathic medicine degree and his master in health administration degree in 1997 from the Des Moines (Iowa) University College of Osteopathic Medicine. A member of the governing board of the American Fascial Distortion Model Association, he is one of three physicians in the United States who are currently certified to teach seminars on the FDM. An AOA board-certified family physician who specializes in osteopathic manipulative medicine, Dr. Capistrant is a former regional dean for the Pacific Northwest University of Health Sciences, College of Osteopathic Medicine in Yakima, Washington. He enjoys working with athletes to maximize performance and with pregnant women to relieve pain.



## Course Times

Sunday, Monday and Tuesday: 8 a.m. to 5:30 p.m.  
Breakfast and lunch are on your own. Coffee will be provided.

## Continuing Medical Education

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## Registration Form

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## Continued from page 31

It is generally acknowledged that the goal of SCS is to regulate dysfunctional muscle tonus by reinitializing muscle spindle activity.<sup>10</sup> Therefore, muscle chains hypothesis should explain how different zones of the body are linked. However, it seems difficult to explain such a global impact (Table 3) by referring only to modifications in muscular chain tonus following treatment.

Beyond producing local and segmental effects that normalize muscle tonus, an adjustment immediately readjusts the proprioceptive system. These proprioceptive messages are generated by the uninterrupted muscular chain that extends from eyes to feet. The messages contribute to developing postural schema of the body and to regulating stability.<sup>20</sup> In fact, muscles play a vital role in managing posture.

According to Roll, muscles have a sensitive role, and proprioceptive muscular sensitivity is the most important source of information in the central nervous system.<sup>22</sup> Roll considers proprioceptive sensitivity to be the “first sense” that gives meaning to the other five senses. So if the proprioceptive system provides erroneous information, the other senses will inevitably be disturbed. Therefore, muscle proprioception seems to be the main ingredient in globalizing the effects of OMTh. In his work on proprioceptors and somatic dysfunction, Korr referred to the role of the musculoskeletal system and its importance as a whole: “Indeed, the sensory input from the musculoskeletal system is so extensive, intensive and unceasing as to be a dominant influence on the CNS and therefore the person as a whole.”<sup>23</sup>

### Study's reproducibility

The reproducibility of this study is based on the principles for employing SCS techniques. At each step, the subjectivity of the treatment provider is controlled by the feelings of the patient.

Once the practitioner has mapped the TPs with SCS, the patient is the person who:

- confirms the presence of a TP by showing sensitivity to the pressure at the area tested by the practitioner.
- classifies the TP according to its intensity.
- validates the adjustment position according to his or her feeling, confirming a decrease in pain intensity of at least 70%.

### Conclusion

This research strongly supports the concept of body unity.

This osteopathic principle is one step closer to no longer being considered dogma<sup>24</sup> but reality.

While we cannot yet affirm by osteopathic experimental tools the tripartite body unit,<sup>2</sup> we can refer to proprioceptive research<sup>21, 23, 25</sup> that emphasizes the interdependence of the proprioceptive system and cognitive functions.

By further validating this principle with osteopathic and other scientific experimentations, we will greatly enhance our ability to explain to patients, health care professionals, and scientists the efficacy of OMTh.

In explaining body wholeness with SCS techniques, a secondary conclusion can be made: SCS techniques have global and nonsegmental actions on the body.

Based on the data from this study, some statistical models are being tested that may further highlight and quantify interactions between different areas of the body and TPs.

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### Changing Health Behaviors (Continued from page 19)

reported exercising decreased significantly on the postsemester test: 61.9% reported exercising 2 or fewer days per week; 27.4%, 3 to 4 days per week; 8.8%, 5 to 6 days per week; and 1.8%, 7 days per week. The calculated *p*-value was less than .05.

#### Energy Drink Consumption

A nonparametric-related sample McNemar test and a frequency analysis were used to compare presemester and postsemester energy drink consumption. On the presemester test, 29.3% of the subject pool reported consuming energy drinks in the previous month, while 40.7% reported doing so in the postsemester analysis. Calculated *p*-value for the variable of energy drink consumption is .007.

#### Conclusion

Subjects' responses regarding the changes in health behavior during the first semester of medical school show significant differences when compared to the data gathered before the semester began. Decrease in sleep and exercise and increase in overall perceived stress and energy drink consumption are all indicative that subjects' health behavior tended to decline throughout the first semester. We hope to follow up on the information from this study to develop greater insight as to what factors have the most significant impact on declining health behavior.

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# AAOJ Submission Checklist

## Manuscript Submission

- Submission emailed to [editoraaoj@gmail.com](mailto:editoraaoj@gmail.com) or mailed on a flash drive or CD to the AAOJ managing editor, American Academy of Osteopathy, 3500 DePauw Boulevard, Suite 1100, Indianapolis, IN 46268-1136
- Manuscript formatted in Microsoft Word for Windows (.doc), text document format (.txt), or rich text format (.rtf)

## Manuscript Components

- Cover letter addressed to the AAOJ with any special requests (e.g., rapid review) noted and justified
- Title page, including the authors' full names, financial and other affiliations, and disclosure of financial support related to original research described in the manuscript
- "Abstract" (see "Abstract" section in "AAOJ Instructions for Contributors" for additional information)
- "Methods" section
  - the name of the public registry in which the trial is listed, if applicable
  - ethical standards, therapeutic agents or devices, and statistical methods defined
- Four multiple-choice questions for the continuing medical education quiz and brief discussions of the correct answers
- Editorial conventions adhered to
  - terms related to osteopathic medicine used in accordance with the *Glossary of Osteopathic Terminology*
  - units of measure given with all laboratory values
  - on first mention, all abbreviations other than measurements placed in parentheses after the full names of the terms, as in "American Academy of Osteopathy (AAO)"
- Numbered references, tables, and figures cited sequentially in the text
  - journal articles and other material cited in the "References" section follow the guidelines described in the most current edition of the *AMA Manual of Style: A Guide for Authors and Editors*.
  - references include direct, open-access URLs to posted, full-text versions of the documents, preferably to the original sources
  - photocopies provided for referenced documents not accessible through URLs
- "Acknowledgments" section with a concise, comprehensive list of the contributions made by individuals who do not merit

authorship credit and permission from each individual to be named in print

- For manuscripts based on survey data, a copy of the original validated survey and cover letter

## Graphic Elements

- Graphics should be formatted as specified in the "Graphic Elements" section of "AAOJ Instructions for Contributors"
- Graphics should not be included with text but sent as separate graphic files (e.g. jpg, tiff, pdf)
- Each graphic element cited in numerical order (e.g., *Table 1*, *Table 2* and *Figure 1*, *Figure 2*) with corresponding numerical captions in the manuscript
- For reprinted or adapted tables, figures, and illustrations, a full bibliographic citation given, providing appropriate attribution

## Required Legal Documentation

- For reprinted or adapted tables, figures, and illustrations, copyright holders' permission to reprint in the AAOJ's print and online versions, accompanied by photocopies of the original work
- For photographs in which patients are featured, signed and dated patient model release forms
- For named sources of unpublished data and individuals listed in the "Acknowledgments" section, written permission to publish their names in the AAOJ
- For authors serving in the US military, the armed forces' written approval of the manuscript and institutional or military disclaimers

## Financial Disclosure and Conflict of Interest

Authors are required to disclose all financial and nonfinancial relationships related to the submission's subject matter. All disclosures should be included in the manuscript's title page. See the "Title Page" section of "AAOJ Instructions to Contributors" for examples of relationships and affiliations that must be disclosed. Those authors who have no financial or other relationships to disclose must indicate that on the manuscript's title page (eg, "Dr Jones has no conflict of interest or financial disclosure relevant to the topic of the submitted manuscript").

## Publication in the JAOA

Please include permission to forward the manuscript to *The Journal of the American Osteopathic Association* if the AAOJ's scientific editor determines that the manuscript would likely benefit osteopathic medicine more if the JAOA agreed to publish it.

Questions? Contact [editoraaoj@gmail.com](mailto:editoraaoj@gmail.com).

# Component Societies and Affiliated Organizations Calendar of Upcoming Events

**December 4, 2014**

Indiana Academy of Osteopathy  
**Muscle Energy for the Lower Half of the Body**  
Hyatt Regency, Indianapolis  
CME: 8 credits of AOA Category 1-A CME anticipated  
Register online at [www.inosteo.org](http://www.inosteo.org).

**December 5-7, 2014**

Indiana Osteopathic Association  
**33rd Annual Winter Update**  
Hyatt Regency, Indianapolis  
(317) 926-3009 • [www.inosteo.org](http://www.inosteo.org).

**February 6-8, 2015**

Texas Osteopathic Medical Association  
**59th Annual MidWinter Conference**  
Omni Dallas Park West  
CME: 13 credits of AOA Category 1-A CME anticipated  
Learn more at [www.txosteo.org](http://www.txosteo.org).

**February 14-18, 2015**

The Osteopathic Cranial Academy  
**Introductory Course: Osteopathy in the Cranial Field**  
Course director: Zinaida Pelkey, DO  
Assistant course director: Daniel A. Shadoan, DO  
Sheraton Hotel Airport, Portland, Oregon  
CME: 40 credits of AOA Category 1-A CME anticipated  
(317) 581-0411 • Fax: (317) 580-9299  
Learn more and register at [www.cranialacademy.org](http://www.cranialacademy.org).

**February 20-22, 2015**

The Osteopathic Cranial Academy  
**Key Elements in Effective Osteopathic Practice:  
A Weekend with Rachel Brooks, MD**  
Course director: Rachel Brooks, MD  
Sheraton Hotel Airport, Portland, Oregon  
(317) 581-0411 • Fax: (317) 580-9299  
Learn more and register at [www.cranialacademy.org](http://www.cranialacademy.org).

**February 20-22, 2015**

The Osteopathic Cranial Academy  
**A Sutural Approach to Osteopathy in the Cranial Field**  
Course directors: Edward G. Stiles, DO, FAAO, and  
Charles A. Beck, Jr, DO, FAAO  
Sheraton Hotel Airport, Portland, Oregon  
(317) 581-0411 • Fax: (317) 580-9299  
Learn more and register at [www.cranialacademy.org](http://www.cranialacademy.org).

**April 8-12, 2015**

The American Osteopathic Association  
of Prolotherapy Regenerative Medicine  
**Spring 2015 Training Seminar:  
Prolotherapy and Cadaver Conference**  
Program chair: Arden Andersen, DO  
Naples Beach Hotel & Gold Club, Naples, Florida  
CME: 24 credits of AOA Category 1-A CME anticipated  
Learn more and register  
at [www.prolotherapycollege.com](http://www.prolotherapycollege.com).

**April 17-19, 2015**

The Osteopathic Cranial Academy  
**The Neurology of Posture – Maxillofacial Influences:  
Teeth, Eyes, Ears, Vertebrae**  
Course director: Maurice Bensoussan, MD, DO, FCA  
Assistant director: R. Paul Lee, DO, FAAO, FCA  
Embassy Suites Hotel, Alexandria, Virginia  
(317) 581-0411 • Fax: (317) 580-9299  
Learn more and register at [www.cranialacademy.org](http://www.cranialacademy.org).

**June 13-17, 2015**

The Osteopathic Cranial Academy  
**Introductory Course: Osteopathy in the Cranial Field**  
Course director: Eric J. Dolgin, DO, FCA  
Assistant director: Michael J. Porvaznik, DO  
Naples Grande Resort, Naples, Florida  
CME: 40 credits of AOA Category 1-A CME anticipated  
(317) 581-0411 • Fax: (317) 580-9299  
[info@cranialacademy.org](mailto:info@cranialacademy.org) • [www.cranialacademy.org](http://www.cranialacademy.org)

**June 18-21, 2015**

The Osteopathic Cranial Academy  
**Annual Conference:  
Traumatic Brain Injury – The Whole Person**  
Course directors: Simeon Hain, DO  
Associate director: Ali Carine, DO  
Naples Grande Resort, Naples, Florida  
(317) 581-0411 • Fax: (317) 580-9299  
[info@cranialacademy.org](mailto:info@cranialacademy.org) • [www.cranialacademy.org](http://www.cranialacademy.org)