
ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

Platform Presentations

Continuing Professional Development and Education Chiropractors' Views and the Design and Development of New Programs

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Continuing professional development in chiropractic and in other health care professions is becoming increasingly important as education and training at the undergraduate level will not sustain practitioners throughout their professional lives. As the evidence and knowledge base is continually evolving, all health care practitioners have a responsibility to keep pace in order to be sure that patients are being treated to the highest possible standards.

In the near future, continuing professional development will be a mandatory requirement in the United Kingdom, ensuring that chiropractors keep up to date and maintain their professional competencies. This study reports on an evaluation of chiropractors' attitudes to continuing professional development and their perceptions of how current continuing professional development and education impact on practice, and on the design and development of new post-graduate education programs to meet the future continuing professional development needs of practitioners.

METHODS

The evaluation of current continuing professional education and development was carried out by a postal survey in which chiropractors gave information on attitudes to continuing professional education and development; impact of current continuing professional education and development on practice; modes of delivery most likely to change practice; and future learning needs.

In response to the learning needs of practitioners, and the imminent implementation of mandatory continuing

professional development, two programs were designed and developed based on adult learning models in the workplace. These programs needed to be flexible for the busy practitioner, but with sufficient rigor to enable learning outcomes to be demonstrated at either the Masters or the Doctorate level.

RESULTS

Chiropractors were positive regarding continuing professional education and development and aware of the need to keep up to date. However, chiropractors did not perceive current continuing professional education to be instrumental in changing practice. As might be expected, chiropractors perceived clinical updates and hands-on practical workshops to be most effective in changing practice.

In developing future continuing professional education and development programs, we concentrated on the application of outcomes in practice, and how they might change and improve clinical and professional skills. The first program was validated in July 2001, and is a part-time Masters in Advanced Professional Development in Chiropractic. Practitioners will undertake classes in the first year in self-directed and work-based learning, learning in a formal setting, and current advances in chiropractic. We are currently developing skills-based modules for year 2, together with modules in evidence-based chiropractic and patient management. A research dissertation, designed to take a further 9 months, completes the program. The second program was validated in May 2001, and is a part-time Professional Doctorate in Chiropractic (PD). As far as we are aware, this is the first program of its kind in chiropractic and, like the Masters program, is designed to enable the practitioner to develop advanced continuing professional development and research skills, but in this case to the Doctoral level. The PD is equal in rigor to the PhD, but different in substance in as much as the research

The Journal of Chiropractic Education

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Vol. 16, No. 1. Printed in U.S.A.
1042-5055/\$4.00

must be undertaken in professional practice, thus bringing together research skills at the highest level and the practice of patient care. Both programs will start in October 2001.

CONCLUSION

This study demonstrates the limitations of current continuing professional development and education provision in

changing practice from the viewpoint of chiropractors themselves, and reports on the design and development of new continuing professional development and education programs. As with all continuing professional development and education programs, they can be judged successful only if they make a difference to professional practice. Whether or not these new programs are effective in changing practice will be the subject of a similar evaluation project in the future.



Exploratory Study of Student Confidence Related to Methods of Instruction

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Many aspects of problem-based learning methods have been studied. The advantages have prompted chiropractic educators to investigate the value of these teaching methods and activities in clinical science classes. These methods encourage self-directed learning, self-appraisal, development of clinical problem-solving skills, and teamwork. Benefits of this style of teaching include flexible curriculum structure, reduced contact hours for students and faculty, better balance of theory with practice, and stronger objectives for classes. Faculty serve as mentors and facilitators in this process. Facilitators act as guides and should have special training. Problem-based learning educators utilize patient scenarios, ask questions, and then require student groups to search for answers. This is a different teaching approach and not all students are comfortable with independent learning. The question of student ratings of faculty utilizing problem-based learning compared with those using traditional methods of teaching has not been thoroughly studied.

METHODS

The purpose of this exploratory study was to test the null hypothesis that there was no significant difference in students' ratings of faculty in a clinical science course taught with different teaching methods. Using two methods of teaching, spinal evaluation was taught in a sixth trimester clinical science course. The control group ($N = 52$) was taught using a traditional didactic approach, while the experimental group ($N = 54$) was taught using a problem-based learning approach. The dependent variable was the outcome of responses noted using the college's standard faculty rating

survey. The independent variable was the actual teaching method.

A faculty evaluation survey was administered to students to rate the faculty that taught both groups. The survey was given in consecutive class hours on the same day allowing no opportunity for communication between groups. Statistical procedures included the mean, standard deviation, independent sample t -test, and the Mann-Whitney U test for each item question and items viewed as a whole.

RESULTS

When all items were viewed as a whole, the independent sample t -test was .941 and the Mann-Whitney U test was .933, suggesting no significant difference between the two groups. The alpha level of .05 was used to interpret significance. There was no significant difference between the two studied groups.

DISCUSSION

It may be important to begin problem-based learning in the first or second year of training to see differences in the clinical years, which may add to the costs of the institution. An individual problem-based learning course offered in a didactic curriculum, such as the one in this study, may engender confusion regarding faculty-student expectations. Students may initially tend to lack confidence in their ability and question their depth of knowledge with the material. Faculty and student tutorial skills and self-directed

learning strategies may be undeveloped. Also, several key components of problem-based learning methods may be missing such as curriculum integration, learning context, and provision of sufficient time to learn. Finally, the college's faculty evaluation form used in this study may not be appropriate or may lack the depth to adequately explore this issue.

CONCLUSION

This study showed no significant difference in rating of faculty between students taught with a problem-based learning approach and students taught with a didactic lecture teaching approach. Therefore we accept the null hypothesis.



The Application of Adult Learning Theories to the Chiropractic Radiography Student

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Emergent trends in education have embraced adult learning models to augment and supplant traditional methods of instruction. Traditional pedagogical models focus on the instructor as the provider of information and the student as passive receiver. Although professional development, improved teaching strategies, more effective methodologies, and more relevant methods of assessment represent essential components of an adult learning emphasis, there is a growing realization that instructors need to be more attentive to how the teaching is manifesting in the learner. Because adults bring a unique perspective and cognitive style to learning, adult educational principles must be considered in planning any curricula that involves adult students (e.g., chiropractic students). Studies of intentional learning and change show that adults prefer to be highly active in their own efforts to change. Adults deem intentional changes to be significant, successful, and beneficial. Malcolm Knowles conducted an extensive literature review, including a compilation of his own extensive efforts, to summarize several mechanisms of adult learning. His work provides a concise summary of the major concepts of adult learning.

Because of the wide use of plain-film radiography as a valuable diagnostic tool in chiropractic, the study of

plain-film interpretation (radiology) and technical execution (radiography) are prominent topics in the chiropractic curriculum. In order to develop courses that maximize students' natural learning processes, the radiographic curriculum must engage the whole person through its cognitive, affective, and behavioral dimensions. Following careful review of current teaching practices, the author of this paper developed strategies to integrate adult learning concepts into teaching a course on the topic of radiographic positioning at a large chiropractic college. Each of the specific changes that developed during this reflection is detailed in the presentation.

Subsequent to these changes, transition from the didactic to clinical setting has been perceived as occurring more smoothly than in the past by students, staff, and faculty. Clinical radiographers report increased confidence in student/patient relations with an increased level of competency in performing assigned radiographic exams.

Educators must be diligent in their pursuit of educational methods and approaches that can be deemed useful and appropriate for adult learners. However difficult this balance becomes, educators have accountability to the adult learner, venturing beyond outdated trends in education and past experiences.



Hyperostosis Frontalis Interna in a Human Cadaver Integrating Clinical Thinking within a Basic Science Course

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The purpose of this study was to produce a list of possible diagnoses for an elderly male human cadaver found with a bilateral symmetrical bony lesion on the internal surface of the frontal bone as well as a symmetrical granular lesion found on the anterior portion of the frontal cortex and temporal lobes of the brain as a way to integrate diagnostic thinking in a basic science course and to review pathologies relevant to chiropractic practitioners.

CLINICAL FEATURES

Upon dissection of the calvarium of the cadaver, a symmetrical osteoblastic bone formation was discovered on the interior of the frontal bone. Also present was a symmetrical granular tumor-like process found on the anterior portion of the frontal cortex and temporal lobes of the brain.

INTERVENTION AND OUTCOME

Further dissection was conducted to determine if any other disease processes were present in the body. Plain films were

taken to verify the presence of hyperostosis frontalis interna and a more complete dissection was done to confirm the presence/absence of the differential diagnoses of the brain lesion.

DISCUSSION

Clinically this case is significant to one who might encounter a patient with symptoms that pertain to those of hyperostosis frontalis interna and/or a brain abnormality. It might be warranted to take plain films of the skull to determine if one or both of these diseases are present in such patients. This case is also significant in the fact that in a basic science course such as Human Anatomy, first semester chiropractic students can integrate various resources such as pathology, radiology, and neurology to diagnose the gross pathology at hand. This makes it possible for the student to treat the cadaver as their “first patient.”



Chiropractic Management of Ehlers-Danlos Syndrome A Report of Two Cases

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The purpose of this report is to discuss two cases of Ehlers-Danlos syndrome presenting for chiropractic evaluation and management of their disabling musculoskeletal pain and associated disorders.

CLINICAL FEATURES

Two disabled patients diagnosed with Ehlers-Danlos syndrome presented with spinal pain including neck pain, back pain, headache, and extremity pain. Commonalities among these two cases included abnormal spinal curvatures (kyphosis and scoliosis), joint hypermobility, and tissue fragility. One patient had postsurgical thoracolumbar spinal fusion (T11–sacrum) for scoliosis and osteoporosis. The

other patient had moderate anterior head translation. Upon presentation, both patients were taking a multitude of medications to manage their pain and disability without satisfactory outcome. Especially challenging in the management of Ehlers-Danlos syndrome are the chronicity of patient complaints and the inherent risk factors to physical management, including increased prevalence of bone fracture and tissue fragility including arterial dissection.

INTERVENTION AND OUTCOME

Both patients were treated with mechanical force, manually assisted spinal adjustments delivered to various spinal segments and extremities utilizing an Activator II Adjusting

Instrument and Activator Methods Chiropractic Technique. Patients were also given postural advice, stabilization exercises, and postural corrective exercises as indicated in Chiropractic Biophysics Technique protocols. Both patients were able to reduce pain and anti-inflammatory medication usage in association with chiropractic care. Significant improvement in self-reported pain and disability as measured by visual analog score, Oswestry Low-Back Disability Index, and Neck Pain Disability Index were reported, and objective improvements in physical examination and spinal alignment were also observed following chiropractic care. Despite these improvements, work disability status remained unchanged in both patients.

DISCUSSION

Chiropractic care may be of benefit to some patients with connective tissue disorders including Ehlers-Danlos syndrome. Low-force chiropractic adjusting techniques may be a preferred technique of choice in patients with tissue fragility, offering clinicians a viable alternative to traditional chiropractic care in attempting to minimize risks and/or side effects associated with spinal manipulation. Psychosocial issues, including patient desire to return to work, were important factors in work disability status and perceived outcome.



Neuromechanical Characterization of Intraoperative Lumbosacral Spinal Manipulation

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The objective of this study was to characterize the neurophysiological, neuromuscular, and biomechanical responses associated with mechanical force, manually assisted spinal manipulation.

SUMMARY OF BACKGROUND DATA

Previous work has characterized mechanosensitive afferent responses to mechanical stimulation in animal models demonstrating the neurophysiological discharges associated with deformation of the viscoelastic spinal tissues. Such data are helpful in formulating a theoretical framework of the mechanisms of spinal manipulation. However, little work has been done in human subjects using clinically relevant methodologies. Intraoperative monitoring techniques have proven beneficial for monitoring neurophysiological events during spinal surgery, but such techniques have only recently been used to study responses of spinal manipulation. No study has simultaneously evaluated the biomechanical and neurophysiological responses of spinal manipulation in human subjects.

METHODS

Four patients (two male, two female) underwent lumbar laminarctomy to decompress the central spinal canal

and neuroforamina as clinically indicated. The integrity of the neural arches, facet joints, and most muscle attachments was preserved. Finely threaded, 1.8-mm diameter intraosseous pins were rigidly fixed to the lumbar spinous process (L1, L3, and/or L4) using fluoroscopic guidance, and a high-frequency, low-noise, 10-g, triaxial accelerometer was mounted to the pin. Following decompression, four needle electromyographic (nEMG) electrodes were inserted into the multifidus musculature adjacent to the pin mount bilaterally and two bipolar platinum electrodes were cradled around spinal nerve roots adjacent to the level of decompression. With the spine exposed, spinal manipulative thrusts (SMTs) were delivered internally to the lumbosacral spinous processes and facet joints and externally by contacting the skin overlying the respective spinal landmarks using three force settings (sham, low, and high) and various force vectors (posterior-anterior; posterior-anterior, and inferior). A total of eight external and eight internal thrusts were applied during this protocol. Neurophysiological responses (multiunit action potentials, MUAP), neuromuscular reflexes, and pin accelerations were simultaneously recorded using a high-speed data acquisition system (triggered electronically). For each thrust, time histories and frequency histories of each of these responses were subsequently characterized in terms of several descriptive parameters, including min, max, peak-peak, and the time duration (DT, milliseconds) between the application of the MFMA thrust and the onset of positive MUAP and nEMG responses. Axial acceleration-time and displacement-time histories were also examined to characterize the neuromechanical responses of spinal manipulation.

RESULTS

MFMA SMTs resulted in positive nEMG and MUAP responses that were typically characterized by a single voltage potential change lasting several milliseconds in duration. However, multiple nEMG and MUAP discharges were observed in numerous cases. With the exception of one patient, the temporal relationship between the mechanical (axial or z -acceleration) and neurophysiological response to an internal MFMA thrust and an external MFMA thrust ranged from 2.7 to 11.2 ms and 3.8 to 39 ms for nEMG reflex and MUAP responses, respectively. Temporal relationships were observed between neuromechanical responses including axial (z -axis) vertebral acceleration, nEMG reflex responses, and spinal nerve root responses.

DISCUSSION

Spinal manipulation results in measurable biomechanical and neurophysiological responses. The vertebral motions that occur (rotations and translations) and resulting spinal nerve root and neuromuscular reflex responses appear to be temporally related to the applied force during SMT. These findings suggest that intersegmental motions produced by spinal manipulation may play a prominent role in eliciting physiologic responses. Knowledge of biomechanical and neurophysiological events occurring during spinal adjustments assists in formulating a theoretical framework to understand the mechanisms of spinal manipulation. An animal model will be used to further investigate spinal manipulation and the clinical relevance of these findings.



Detection of Artificial Leg Length Inequality

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Various forms of prone and supine leg checking abound in the chiropractic, osteopathic, and physical therapy professions. Interexaminer reliability studies have shown varying results, with outcomes ranging from very poor to moderate. By comparison, there has been very little research on the validity of the various forms of leg checking, so that little is known about what putative pathology it may identify, or how clinical outcomes might be affected by the results of this examination procedure. Even high levels of interexaminer reliability, were they consistently obtainable, would be hard to interpret without a gold standard (i.e., both examiners might agree, and yet be wrong in their assessments). As a preliminary step, one that has never to our knowledge been taken, we set out to calibrate the leg-checking method being used, to confirm that it can at least detect a known degree of leg length inequality (LLI).

METHODS

We used a pair of surgical boots with a Velcro closure, screwed to a thick wood footprint, with long headless nails pointed medially from the heel as an indicator for y -axis foot translation. In one experimental trial, a known number of shims (0–6) was inserted into either a left or right surgical boot by a research assistant. A blinded examiner performed a leg check, assessing the location of each foot in absolute terms by observing where the medially directed nails point in relation to a metric ruler which is mounted between

the legs of a prone subject. The leg-checking method has been previously described as “compressive” leg checking, in that mild (but unmeasured) cephalad force is applied by the examiner. Since there are six shims and two legs, there are 13 experimental conditions possible: left one, left two, left three, left four, left five, left six, right one, right two, right three, right four, right five, right six, and zero shims. The experimental trial called for two each of these possible conditions to be tested, for a total of 26 conditions. The order in which the shims were inserted into the surgical shoes was determined by a random number generator.

RESULTS

Data have been collected in a number of trials, involving two subjects and two doctors. They show a very high degree of interexaminer reliability, a similarly high degree of intraexaminer test-retest reliability, and a tight association between the observed changes in LLI and the shim-created changes in LLI.

DISCUSSION AND CONCLUSION

The data support the assertion that a blinded examiner, using the compressive method of prone leg checking, is

capable of fairly accurately detecting artificially created LLI, and that the examiner's assessments seem proportional to the degree of artificial LLI created. This suggests that compressive leg checking may be a reliable examination

procedure, in that it can accurately detect true LLI. Therefore, it is reasonable to use compressive leg checking as an assessment vehicle, although the clinical validity remains to be seen.



Degenerative Changes of the Articular Processes Following Spinal Fixation

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A hypothesized benefit of spinal adjusting is the reversal of intra-articular changes that occur within hypomobile zygapophyseal joints. However, no anatomic changes of zygapophyseal joints following hypomobility have been published.

METHODS

Using an established small animal model of spinal fixation, three contiguous lumbar segments (L4, L5, L6) of rats were fixed with a specially engineered spinal fixation device. Zygapophyseal joints of control rats were compared with those of rats that underwent vertebral fixation for 1, 4, and 8 weeks. Twenty-three controls and 50 experimental animals were used in this study. The experimental animals were further subdivided into 15 1-week fixation animals; 18 4-week fixation animals; and 17 8-week fixation animals. A total of 584 zygapophyseal joints (left and right L3/L4, L4/L5, L5/L6, L6/S1) and 1,168 articular surfaces were evaluated macroscopically for the presence of osteophytes and for signs of articular surface degeneration. These degenerative changes were then rigorously graded on a scale of 0–3, a score of 3 being most severe. Data were analyzed by 1) determining the total number of zygapophyseal joints per animal with osteophytes and the total number of facet surfaces per animal with signs of articular surface degeneration, and 2) determining the average score (0–3) of osteophytes and articular surface degeneration.

RESULTS

Table 1 summarizes the data by control and fixation group.

Osteophytes

The total possible number of zygapophyseal joints with osteophytes per animal was eight (left and right L3/L4–L6/S1 = eight zygapophyseal joints). We found that the longer the animals were fixed, the greater the number of osteophytes that developed. Further study showed that the differences for the controls and the 1-week fixation and 4-week fixation groups generally lessened with time. This was not the case for the 8-week fixation group, which had more osteophytes than animals in any other group. Also, the number of osteophytes remained relatively the same from 1 to 12 weeks after fixation was removed in the 8-week fixation group.

Articular Surface Degeneration

The total possible number of degenerated surfaces was 16 (cephalad and caudal articular surfaces × eight zygapophyseal joints = 16 articular surfaces). Very robust changes were found. Spines fixed for 4 weeks showed changes similar to 8-week fixation animals. Differences found between the control animals and all animals that underwent spinal fixation (1, 4, or 8 weeks) were statistically significant ($p < .05$) for both the total number of degenerated articular surfaces per animal and for average severity of articular surface degeneration.

DISCUSSION

Zygapophyseal joints underwent degenerative changes following spinal fixation in this small animal model. There appears to be a threshold of time when osteophyte formation and articular surface degeneration becomes so severe that very little return to normal occurs, even after a considerable length of time. Degenerative articular surface changes preceded osteophyte formation.

Table 1. Zygapophyseal joints or articular surfaces with changes per animal and average severity of change

	Controls	1-Week fixation	4-Week fixation	8-Week fixation
Osteophytes–total/animal	3.0 (1.3) ^a	3.3 (0.8)	4.7 (2.2)	7.2 (0.8)
Osteophytes–average severity	0.5 (0.3)	0.5 (0.1)	0.6 (0.4)	1.3 (0.5)
Articular surface degeneration–total/animal	3.0 (1.8)	7.3 ^b (3.9)	12.5 ^b (2.4)	14.1 ^b (1.7)
Articular surface degeneration–average severity	0.3 (0.2)	0.6 ^b (0.3)	1.3 ^b (0.4)	1.7 ^b (0.3)

^aStandard deviations in parentheses.

^bStatistically significant ($p < .05$).

CONCLUSION

We conclude that zygapophyseal joint changes occur following spinal fixation in this rat model and the amount and severity of degeneration is time dependent with a threshold of between 4 and 8 weeks for osteophytes and less than 1 week for articular surface degeneration.

ACKNOWLEDGMENT

This study was funded through grant 97-10-18 from the National Chiropractic Mutual Insurance Company (NCMIC) and administered by FCER.



Effect of Neck Pain on Perception of Verticality

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Neck pain, which is a significant problem in industrialized countries, may also be accompanied by other symptoms such as dizziness, light-headedness, or blurred vision. Although these sensations are difficult to quantify objectively in the absence of positive vestibular or neurological tests, they can represent impairments to activities of daily living, return to work, and quality of life. Recently, several approaches have been taken to measure altered spatial orientation that would give rise to such symptoms. The objective of this study was to use the rod and frame test as a quantification of the perception of verticality in subjects with and without neck pain. Our purpose was to determine whether subjects with neck pain have greater errors in judging the vertical than subjects without neck pain.

METHODS

This cohort study compares perception of verticality in a sample of 19 symptomatic subjects with uncomplicated neck

pain and 17 control subjects selected from two chiropractic offices in the Niagara Peninsula. The intervention is a rod and frame test to measure perception of verticality.

RESULTS

A two-way ANOVA showed statistically significant differences in judging the vertical between symptomatic and asymptomatic subjects. Unpaired *t*-tests for each test situation and a Tukey's post hoc test showed statistical differences for both groups.

CONCLUSION

This study indicates that subjects with neck pain have greater errors in judging the vertical, as measure by the rod and frame test.



Motor Excitability Changes Associated with Lumbar Spine Manipulation

A Transcranial Magnetic Stimulation and H-Reflex Study

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The neurophysiologic mechanism in which spinal manipulation may reduce pain and muscular spasm has not been elucidated. One proposed mechanism is that spinal manipulation may intervene in the cycle of pain and spasm by affecting the resting excitability of the spinal motoneuron pool. Previous studies indicate that spinal manipulation leads to attenuation of the excitability of the motoneuron pool, when assessed by the Hoffmann reflex (H-reflex). However, these previous H-reflex findings of motoneuron inhibition appear to be in contrast to other investigations in which spinal manipulation has been reported to produce a reflexive activation of paraspinal musculature. The H-reflex response, however, is highly susceptible to presynaptic inhibition of Ia afferents, which mediate the reflex. In order to assess the recruitment gain of the motoneuron pool, a technique that activates only postsynaptic mechanisms is preferable, because modulation of the H-reflex response is dependent upon the summation of presynaptic and postsynaptic mechanisms on the Ia-alpha motoneuron synapse. Transcranial magnetic stimulation (TMS) is a noninvasive tool to study effects of corticospinal inputs on alpha motoneuron pool excitability. The purpose of this study was to determine the effects of lumbar spinal manipulation on the excitability of the motoneuron pool, as assessed by TMS and the H-reflex.

METHODS

Healthy subjects were recruited for participation ($n = 12$). All procedures were approved by the local institutional review board. Motor evoked potentials were recorded subsequent to TMS. Motor evoked potential peak-to-peak amplitudes in the right gastrocnemius muscle were measured before and after a homolateral L5-S1 spinal manipulation. The subjects returned 48 hours later for a follow-up session in which tibial nerve H-reflexes were performed in the same pre-post spinal manipulation protocol as with the motor evoked potentials. Separate, single-factor repeated measures ANOVA models were used to determine the effects of a L5-S1 spinal manipulation procedure on motor evoked potential amplitudes and H/M_{\max} ratios. The Dunnett's procedure for a priori contrasts was used to detect any differences between baseline values and postmanipulation time points for

each evoked response, motor evoked potential amplitudes, and H/M_{\max} ratios. An optical tracking system (system error <0.10 mm RMS) was used to monitor the 3-D position and orientation of the TMS coil, in real-time, for each trial.

RESULTS

There was a significant increase in motor evoked potential amplitudes from 20 to 60 seconds, postspinal manipulation ($p < .05$). There was a significant decrease in H/M_{\max} ratios from 10 to 40 seconds, postspinal manipulation ($p < .05$). The relationship between the pre-baseline evoked responses, motor evoked potential amplitudes, and H/M_{\max} ratios was low ($r = .14$). Immediately postmanipulation, the relationship between the amount of motor evoked potential facilitation and the amount of H/M_{\max} ratio inhibition was moderate ($r = -.41$). The optical monitoring precision results for coil placement revealed that there was no significant deviation of coil placement throughout the experiment.

DISCUSSION AND CONCLUSION

There was a different modulation of motor evoked potential amplitudes and H/M_{\max} ratios following a L5-S1 spinal manipulation procedure. The increase in motor evoked potential amplitudes suggests that spinal manipulation may increase the ratio of excitatory postsynaptic potentials to inhibitory postsynaptic potentials by altering the excitability of interneurons contacted by Ia and Ib afferents as well as by cutaneous and joint afferents. Concurrently, spinal manipulation may decrease presynaptic inhibition of Ia afferents as evidenced by inhibition of H/M_{\max} ratios. Thus, spinal manipulation may involve two apparently separate basic physiologic responses: a central motor facilitation and a peripheral sensory inhibition. These basic neurophysiologic responses to spinal manipulation require further research to determine the possible role they may play in the effect of spinal manipulation on pain and spasm in the mechanical low back pain population.



Increasing Active and Individualized Learning in a Large Cohort Geriatrics Course

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The offering of coursework in geriatrics can be found at virtually every accredited chiropractic institution in North America. An opportunity to develop a “model curriculum” in geriatrics for the chiropractic profession was facilitated by several contracts through the United States Health Resources and Services Administration (HRSA). A model has been developed, and pilot tests of the model have been delivered and assessed. Most of these pilot tests involved small cohorts (<40 students). Our institution is attempting to apply the model to an entire (matriculating) class cohort of over 100 students.

OBJECTIVES

The objective of this endeavor is to determine if the model curriculum can be delivered successfully to large groups. The instructors are striving to meet the spirit, if not the letter, of the model in this attempt. A focus on independent and active learning is central.

METHODS

Students were provided a “laundry list” of activities they could select to earn their grade. Each activity has predetermined point values, and students may also propose activities of interest. The activities are categorized as Interactive (there is actual contact with an aged person), Observation (students witness others interacting with elders), or Informational (the use of materials or participation in experiences related to but not necessarily involving older people). Each student must complete one Interactive experience and one Informational experience (specifically the creation of a resource list of services available for older persons in the location the student intends to practice after graduation). No written exams are required to complete the course, but they are available. Each student must participate in a team activity providing care for a mythical patient. The condition of each

patient is manipulated by sporadic input from the instructors, and each student assumes responsibility for determining and documenting appropriate interventions in a specific domain. Resource materials are brought to the classroom, and time during class is provided for group inquiry and discussion. The proposed intervention must be submitted within 2 weeks of the in-class activity. Each group was provided a posterboard and has created a visual representation of their patient. Four-by-six cards, color-coded for each solution for the problems provided by the instructors, will be fastened around the border of the posterboard.

Students will take pre- and postcourse assessments, including the Palmore Facts on Aging Quizzes, Perceptions on Professions Questionnaires, and the Aging Semantics Differentials. Students will critique each other’s care plans, as well as the activity itself. Our institution will also collect student feedback on the course and instructors.

DISCUSSION

Course work in chiropractic colleges should allow students to experience, not only hear about, the type of care they will deliver in the field. The delivery of this course provides an opportunity to determine how the “model curriculum” for geriatrics in chiropractic can be delivered to groups many times larger than those imagined in the model. It will provide the opportunity to determine student success and satisfaction with more active and independent types of learning, and assist in identifying those limits and benefits inherent in a system that routinely includes large student cohorts.

As the population continues to age, it is essential that chiropractors possess the knowledge, attitudes, and skills essential to providing care to this segment of the population. Although there is much about aging that can be presented in lecture format, real skill development will not occur without practical application. A model curriculum has been developed and tested. Students should not be deprived the opportunity to experience a “model education” merely because they are part of a large cohort.



Live Lecture, Interactive Video Conferencing, and On-line Learning Compared Is There a Difference in Learning Outcomes?

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In September 1999, New York Chiropractic College (NYCC) began the implementation of a revised curriculum. This revision, among other things, necessitated the use of video-conference technology in order to deliver the Concepts in Pharmacology course. This 2-credit 8th trimester lecture course had been previously presented as a standard PowerPoint-assisted campus-based lecture.

With the 8th trimester now occurring in the off-campus health centers, video teleconferencing was seen as a reasonable solution to the dilemma of consistency and subject mastery that suddenly faced the college. After a somewhat bumpy start, 5 trimesters were completed and it seemed that learning, as adjudged by test results, was indeed occurring (in spite of or thanks to, the interactive video conferencing). Student satisfaction with this medium, however, was still not universal.

The instructor of the course suggested, therefore, that another option be allowed—that of an on-line course. Since the instructor had just completed a Masters Degree in Teaching using Internet Technologies, she felt that a certain segment of the student population would prefer this method to the standard presentation (available to the Seneca Falls interns) or the interactive video conferencing presentation (available to the off-campus interns). Thus, in April 2001, the Concepts in Pharmacology course was offered in those three different options.

The content remained the same, but the organization necessarily had to be different. It was also decided that the tests would be the same regardless of the delivery system. This was deemed the only way to measure if the learning outcomes differed among the groups. The objective was identified as answering the following question: "Is distance learning (i.e., interactive video conferencing and on-line learning) as valid a course delivery method as a face-to-face lecture in the Concepts in Pharmacology course?"

METHODS

A 50-point short answer and essay question midterm and a 50-point short answer and essay question final examination were given to the students as the only grading opportunities for the course. In order to assure for blinding of the instructor while grading the exams, only the student's ID number, and not her/his name, was identified on the student answer sheets. In this way, the instructor could not know which student she was grading and, more importantly for the study, which learning medium had been used. It was only when it came time to enter the grades on the roster did the instructor then discover who had achieved what grade. The results of each of the three groups were then statistically compared for any variance.

RESULTS

The final exam, like the midterm, showed no statistically significant difference among the groups in the means of the scores.

DISCUSSION

This study adds to the growing body of evidence that properly designed, on-line learning can be an effective course delivery option. A teacher is a teacher regardless of her/his medium. Further, if the learning activity is well designed and the student has the opportunity to self-select her/his course delivery style, then learning naturally follows. This study is one of the first to compare three different delivery methods in the same course. It was able to show (albeit with a small sample size) that there indeed is more than a single way to reach a learning goal, even in the context of the same course.



Combating Ageism Through Student Education

Brian J. Gleberzon, D.C., Canadian Memorial Chiropractic College

Although chronological age is perhaps the easiest manner to describe an individual and to make physiological,

psychological, and emotional judgments about them, it is very inaccurate. Despite this, many societal decisions are

often based solely on an individual's chronological age. This article describes a pedagogical approach to combating ageism by effecting attitudinal changes among health care students, the professionals of the future. These approaches have been implemented at both the Canadian Memorial Chiropractic College and the Canadian College of Naturopathic Medicine.

METHOD

A review of the literature was conducted, with interpretation and synthesis by the author. Topics reviewed included issues germane to ageism as well as geriatric chiropractic care and education.

RESULTS

Based on the literature review, the following seven pedagogical approaches were implemented:

1. *Holding up a mirror*: Students are asked to call out the words or phrases they think of when asked to define an older person. Typically, chiropractic or naturopathic students generate lists of adjectives and phrases associated with growing old that are unflattering.
2. *Didactic information*: Students are provided with the body of knowledge that indicates that older patients can benefit from an eclectic group of treatment options that includes manipulation and other manual therapies, rehabilitation, nutritional advice, use of botanical and homeopathic medicines, podiatric care, and preventative strategies to the same extent as their younger counterparts.
3. *Community-based educational program*: This approach allows students to interact more intimately with various groups of individuals, in order to develop a more equalitarian rapport with them. Community-based educational programs provide important pedagogical opportunities for students, as well as providing important health-related information to attendees.

4. *Role-playing*: Students participate in a unique interactive learning opportunity entitled "Through Other Eyes." This project allows students to appreciate how different disabilities may impact a person's life by role-playing and simulation.
5. *Emphasizing the contextual approach to health care*: Contextual medicine views disease as a process rather than a discrete entity, and this approach emphasizes that disease may be the reaction to a variety of environmental, psychosocial, genetic, and other factors.
6. *Monitoring qualitative and quantitative health changes*: Many authorities suggest that clinicians orient themselves away from the exclusive goal of pain relief, and instead focus on the restoration of functional abilities, as well as psychosocial interactions and emotional well-being, especially among older patients, who place a high value on chiropractic maintenance care, in order to achieve these goals.
7. *The hospice model*: This model can be applied to those older persons who are not terminally ill because this model emphasizes that each person is unique, that everyone dies, that comfort and happiness are very important, the adverse consequences of medical evaluations and treatments, a willingness to compromise in carrying out treatment plans, and an ability to treat without diagnosing.

DISCUSSION

Studies indicate that the ageist attitudes of health professionals toward the elderly tend to be the same (or worse) than those attitudes found in the rest of society. As a result, practitioners may label older patients as being resistant to treatment, possessing rigid outlooks, being unrealistically demanding, and clinically uninteresting. As a consequence, they may be provided with only generic and narrow treatment options. However, other studies suggest that these negative attitudes can be overcome through student education.



The Technique Consortium of the Association of Chiropractic Colleges The First 20 Years

Brian J. Gleberzon, D.C., Canadian Memorial Chiropractic College, and **Robert Cooperstein**, M.A., D.C., Palmer College of Chiropractic West

In commemoration of the 20th anniversary of the ACA Panel of Advisors to the ACA Council on Technic (that has

evolved into the Technique Consortium), it seems appropriate to recount some of its past and current activities.

METHOD

A review of the literature and minutes of several meetings of the Technique Panel and Technique Consortium were examined, in addition to interviews of original and current Council members.

RESULTS

The review demonstrates that the Panel has provided several important pedagogical benefits to the chiropractic profession. These are visits to different chiropractic colleges along with presentations on curricular issues; presentations by several technique developers which led to the publication of several scholarly papers on issues germane to chiropractic technique and evaluation; technology assessment of new innovations within the profession; discussion of common educational issues surrounding evaluation methods, instruments, protocols, and conflicts; liaison with other chiropractic organizations; a venue to present research findings; and it was one of the earliest intercollegiate organizations in chiropractic, predating the research consortia and the Association of Chiropractic Colleges.

DISCUSSION

In the late 1970s, Dr. J.R. Campbell, then President of the ACA Council on Technique, suggested that the divisiveness within the chiropractic profession could be overcome by a detailed study of the "subluxation." In response, the ACA Council of Technique conducted its first "Conference on Technique Fundamentals" in the fall of 1983 at Cleveland College (LA), and semiannual meetings have been conducted at different colleges on a rotating basis.

Agenda items from early meetings included identifying the most commonly used chiropractic techniques and indications of their use (biomechanic, radiographic, neurological, etc.); efforts to improve terminology and listing methods; developing a database of technique-related textbooks and articles; changing postgraduate programs; requirements for technique instructors and examiners; the importance of

research; and efforts to tackle the "subluxation question." The Panel purposefully avoided any position statements that would contradict the philosophy or mission statement of any of the member chiropractic colleges, assuming instead consultative and advisory roles.

Between 1993 and 1995, the Panel cosponsored three national symposia to compare chiropractic technique procedures. A number of review articles were published on techniques including receptor-tonus, Logan basic, applied kinesiology, Thompson terminal, chiropractic biophysics, sacro-occipital technique, diversified, and Activator methods. Other presentations have been on active release technique, pattern analysis theory, and motion palpation.

In the fall of 1996 the Panel decided to strengthen its ties with the Association of Chiropractic Colleges. The last outstanding project of the Panel, the convening of an expert panel to rank the indications for specific adjustive methods for specific low back conditions, has now been completed for publication.

Entrepreneurs of new technological innovations often use the Consortium as a preliminary stop prior to addressing chiropractic colleges. Examples include Docu-Adjust and DyneAdjust. Research presentations are conducted, and the Consortium has been asked to comment on the impact of declining student enrollment, and technology and the Internet.

Representatives often describe how the evaluation process is conducted at their respective college. Student issues have been discussed, including academic fraud, attendance, disrespect towards faculty, a sense of entitlement to set a student-set agenda, and the influence of outside forces.

Lastly, the Council often serves as liaison with representatives of other chiropractic organizations, including the FCLB and NBCE.

CONCLUSION

The Council and Consortium has fostered communication within the chiropractic profession from members of diverse ideological backgrounds. The original Council played a seminal role in the development of the spirit of intercollegiate cooperation that culminated in the rise of the Association of Chiropractic Colleges.



Teaching Ethics with Attitude Reaching Out to Generation X

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Because health care professionals are held to a higher ethical and professional standard than society, it is incumbent

upon chiropractic colleges to teach a core set of moral principles, virtues, and professional action guidelines.

Students, especially members of the ominously labeled “Generation X,” often cannot relate to current teaching strategies. This generation, described as “more likely to be cynical slackers who go in for depressing music and ironic detachment” creates a challenge. How does one get through to a generation whose cartoon heroes are the kids from South Park?

Certainly one of the goals of a chiropractic education must be to transform the student into an ethical and professionally acting doctor and community leader. Colleges must accept their responsibility to create this transformation. They must also have a clear idea of what message needs to be delivered. The purpose of this paper is to describe the methods used to create a new ethics course, describe the new course content and teaching strategies, and report on the students’ perceptions and outcomes with the course. Also presented will be what it means to teach “ethics with attitude” and to help make recommendations for instructors attempting to utilize these methods.

METHODS

Based upon previous course experience, a literature review, and discussions with students, faculty and administrators, a number of important issues were identified. These included making the course “trimester appropriate” and “generation appropriate.” Also a collection of topics was developed that created a good introduction to ethics and professionalism. Other material more germane to near-graduates was distributed to other courses.

Previous experience highlighted the need for stimulating presentations that would engage the students in discussion inside and outside of class. A commitment was made to find provocative movie and TV video clips, news or magazine articles, and photographs that would be worked into every

lecture. Also, whenever possible, music (sometimes with slides shows) or musical references were used in lectures to accent certain points. Additionally, widespread use of newspaper, magazine, and book articles/photos and private collection photographs were used in each lecture.

Assessment was redesigned to be more rigorous, although not so difficult as to cause undue stress. A new course title was formulated (Contemporary Chiropractic Philosophy) partly because it veiled the ethics content. To evaluate its success, a comparison of the student evaluations and the final grade distributions between a typical trimester of the new and the old course was made.

RESULTS AND DISCUSSION

An analysis of the students’ course evaluation showed there was a positive increase in student perceptions about the mastery of the material by the instructor, as well as with the interest generated for the new course and its presentation style. The issue of lower grades did not negatively impact students’ perception of the course, and this was probably attributable to the new course design. Future studies will have a student evaluation performed after final grades are given. Also, this author feels that the creative enjoyment for this course far exceeds that of the previous course, and this is reflected in greater enthusiasm during lectures.

It appears that the right chemistry of topical issues, creative teaching strategies, and a “little bit of attitude” has positively impacted the student outcomes in terms of interest and appreciation despite more rigorous testing. Whether there is a real change in student attitudes and behavior is still a question and is an area for further research. Also, while some negative attitudes might have existed within the X Generation, it is this author’s experience that they are quite eager to learn what is right. They just need to hear it from the appropriate source.



The Chiropractic Research Review **A Collaborative Effort to Increase Research Consumerism Amongst Practicing Chiropractors**

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There is recognition from many in the profession of the need for increased use of research in clinical practice. Some people feel that field doctors would be more likely to become consumers of research if the information was presented in a time-efficient, clinically relevant, and understandable nature,

an uncommon set of features for most journal articles. Many researchers are unaware that a service such as this already exists and that it is circulated to 26,000 chiropractors. Our objective was to describe and discuss the methodology used to produce this widely distributed newsletter, called the

Chiropractic Research Review (CRR). Results of a CRR consumer satisfaction and utilization survey will also be reported.

METHODS

A description of how the CRR is created and circulated is provided. In order to improve the CRR and to ascertain whether or not it should continue into a 5th year of publication, a 10-item survey was mailed to the readership. A frequency count of the journals used as sources of research articles was conducted to identify the total number of journals and journal articles accessed for CRR summaries, and to estimate the relative cost to subscribe to the number of journals summarized in the CRR.

RESULTS

In the 3.5 years of publication, a total of 938 articles have been reviewed from 164 different journals. The cost to subscribe to this many journals is approximately \$44,066 per year. A total of 1,332 surveys were returned. Over 90% of respondents read the CRR, and 85% read it within 1 week of receiving it. Seventy percent of the respondents state that they use ideas from the CRR to help them in their practice. Ninety-seven percent of respondents feel the information contained in each issue of the CRR is either somewhat or very valuable. If the CRR was discontinued, 78% of the respondents stated that they would miss the publication. Seventy-two percent of respondents forward the CRR to other people, primarily their office staff and patients. Sixteen percent indicated that they forward the CRR to other health care professionals and

11% send it to other people, such as current and prospective chiropractic students.

DISCUSSION

The survey used in the study had a low response rate, introducing sources of bias into the study. It is very difficult to instigate actual clinical practice behavior changes unless one faces litigation or may benefit from reimbursement. Whether the CRR invokes such changes may be a topic for future study. However, it is apparent that chiropractors use the CRR to extend their practices with other professionals and patients. How they do this remains to be determined and measured. Thought needs to be given to how much is actually learned from reading the synopses, rather than full papers. Concerns that this could lead to oversimplification of the literature have been voiced and need to be addressed. However, it can also be argued that it is better to have doctors reading some research, even a simplified synopsis, than no research at all.

CONCLUSION

Of the survey respondents, 90% state that they read the CRR, 70% state that it helps them in their practice, and 78% said that they would miss it if it were discontinued. Researchers and scholars are largely unaware of the CRR and have voiced concern that chiropractic research needs to be disseminated to chiropractors in a format that is easy to read and understand. It is clear to us that the field doctors not only are interested in such an idea, but that the publication already exists. It is hoped that the presentation of this study to the scholarly community will help bridge this gap.



Needs Assessment of Biomechanics Research and Teaching at Chiropractic Institutions

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This position paper surveys the role of biomechanics as it applies to education and research within chiropractic institutions. Methods include literature search through Medline and proceedings of chiropractic conferences as well as site visits to some of the chiropractic institutions in the United States. There is a limited use of biomechanics in research and teaching activities related to chiropractic. The depth of instruction, however, needs to be increased in scope if the education of students is to keep pace with the rate of research development related to the practice of health care delivery. If sustained research is to be expected, substantive

commitment of resource will be necessary to educate and mentor select students to prepare them for a research career in biomechanics. The most direct and imminent approach is to develop a knowledge base of the biomechanics of the manipulable lesion and of spinal manipulation. Such knowledge will be transferred during the training of future chiropractors. It will also form a core database for the discipline of chiropractic science and practice. Specific elements include the biomechanical understanding of the normal and pathological skeletal kinetic chain, especially of the spine, the kinematics and external forces involved in spinal adjusting/manipulation,

the internal biomechanical effects of these procedures, and development of computer modeling and animation of spinal manipulation for visualization purposes. There is also a need to develop and quantify skill of performance in training future doctors of chiropractic.

Chiropractic institutions have limited biomechanics content in their curriculum. Qualitative understanding of biomechanical structure and function for the spine and extremities is presented in one of three ways. It may be taught as a stand-alone survey course or as a subtopic within the study of anatomy. It may also appear as a part of physical diagnosis topics including the palpation and assessment of the spine and extremities. Most of the materials the students experience cover the normal and abnormal kinematics of the extremity joints, spinal regions, as conceived to relate to pathology and/or subluxation. Few institutions introduce basic orthopedic biomechanical concepts related to the tissue, bone, cartilage, and intervertebral disc and none address quantitative aspects. Despite the fact that manipulation, clearly a mechanical process, is a mainstay of the professional practice of chiropractic, most of the institutions have no rigorous development of the biomechanics of manipulation incorporating the body of knowledge that is available in the scientific literature. Biomechanics laboratories to demonstrate

principles through experimentation are not a part of the usual training program.

Chiropractic curricula are burdened with legislative requirements from multiple state jurisdictions where graduates are likely to apply for licensure. Attempting to fulfill the various state requirements for their students, colleges are limited in the ability to be flexible in setting the curricula and responding to scientific and clinical advances. The chiropractic student is under a heavy workload of courses under the current constraints with limited time available for electives. However, there is a need to revise and update existing course materials and introduce elective courses in more advanced biomechanics for interested students. Developing a joint Doctor of Chiropractic and Master of Science career track with integrative components of biomechanics, advanced anatomy, and neuroscience, research methodology would serve the profession by preparing clinicians to perform as clinical scientists, advancing the state of the art. A post-graduate program in clinical biomechanics would assist in the continuing education and advancement of graduate, practicing doctors.

The author acknowledges the financial support from Health Resources and Services Administration (HRSA). Technical suggestions from Drs. Triano and Brodeur are acknowledged.



Development of a Workbook Incorporating Actual Journal Papers to Assist Chiropractic Students and Practitioners in Critically Reading and Understanding the Health Care Research Literature

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This workbook was developed in response to student requests for practical examples of how to critically appraise research papers. It uses a format that does not yet appear to be available in the health care literature. The purpose of this workbook is to expedite chiropractic students' and field practitioners' understanding and practical application of critical literature appraisal concepts; this, in turn, will assist this target audience in becoming good consumers of the health care research literature, and hence, responsible, qualified, evidence-based health care providers.

METHOD

The format and content of the workbook was developed based on several years of informal feedback from chiropractic

students, as well as formal qualitative feedback from a student and field practitioner test panel.

RESULTS

The first edition of the workbook consists of eight journal papers relevant to chiropractic selected from the peer-reviewed health care research literature. These papers were selected because they illustrate both good and bad methodological characteristics across a spectrum of different types of research designs and overview papers. Each paper comprises a chapter, and is reproduced as closely as possible to the original journal format, on the left side of a page, with questions and notes corresponding to specific highlighted areas on the paper (similar to "margin notes"), positioned on the

right side of the page. The answers and their explanations are presented at the end of each chapter.

DISCUSSION AND CONCLUSION

Conceptually, this workbook appears to be a useful tool for addressing an important educational need, but the

performance of this tool needs to be assessed on an ongoing basis. Therefore, the next phase of this project will be the implementation of a randomized controlled trial (RCT). It is hypothesized that a random sample of students comprising the experimental group will achieve better grades in a critical reading course, and upon follow-up a few years later, demonstrate a greater propensity to practice evidence-based chiropractic, than a control group that is not exposed to the workbook.



Changes in Sagittal Lumbar Configuration with a New Method of Extension Traction Combined with Spinal Manipulation and Its Clinical Significance Nonrandomized Clinical Control Trial

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Nonrandomized, clinical control prospective case analysis of 48 consecutive patients was compared to 30 control subjects to evaluate the clinical significance of a new method of 3-point bending lumbar extension traction. Sagittal lumbar alignment changes have been reported postsurgically, but not with conservative methods.

METHODS

Inclusion criteria were chronic low back pain without radiculopathy and reduced lumbar lordosis. Patients received a few sessions of lumbar spinal manipulation and a new type of appropriate lumbar extension traction for mean of 36 sessions over 12 weeks. Patients were positioned supine with an anterior pull at the maximum deviation from the normal lumbar ellipse. Traction duration increased 1 minute per session from a beginning of 3 minutes until 20 minutes was maintained. Pretreatment and post-treatment pain scales and lateral lumbar radiographs were analyzed. Thirty-four out of 48 (71%) subjects returned for long-term follow-up at a mean of 14.6 months after the first follow-up.

RESULTS

Pain scales and radiographic measurements did not change in control subjects. For the traction group, visual analogue scale ratings decreased from mean of 4.4 ± 1.9 pretreatment to 0.6 ± 0.9 post-treatment and radiographic angles (except at T12-L1) showed statistically significant changes. Mean changes were 5.7° at L4-L5, 11.3° between posterior tangents on L1 and L5, 9.1° in Cobb angle at T12-S1, 4.6° in pelvic tilt, and 4.7° in Ferguson's sacral base angle. At long-term follow-up for 34 out of 48 subjects, improvements in lordosis were maintained.

CONCLUSION

Extension 3-point bending lumbar traction combined with lumbar manipulation can increase lumbar lordosis in a mean of 12 weeks as indicated by increases in segmental and global lumbar alignment. Approximate mean increases were 6° at L4-L5, 11° between L1 and L5, 9° in T12-S1 Cobb, 5° in pelvic tilt, and 5° for Ferguson's angle. At long-term follow-up, improvements in lordosis were maintained.



Stability of Paraspinal Thermal Patterns During Equilibration

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Analysis of paraspinal heat patterns assist the chiropractor in determining if neurological adaptability has been compromised due to vertebral subluxation, but these patterns may change simply because of thermal challenge of the cooler room temperature after the back is bare, thus confounding the analysis. Medical thermographers (and some chiropractic thermographers) recommend a 15-minute acclimation period before commencement of a thermographic reading. The present research seeks to determine what, if any, changes might occur in heat patterns during an acclimation period.

METHODS

Data were collected from nine subjects. Each subject received an initial reading 1 minute after the shirt was off. The next reading was taken 5 minutes later, followed by a reading every 5 minutes. Readings were analyzed via the pattern calculator. Each reading is compared to the reading before and after and a percent similarity established.

RESULTS

In the nine subjects who were acclimated for 21 minutes, there was a trend toward increasing similarity between successive the readings with the passage of the equilibration

period. The delta (side-to-side) channel is probably the thermal differential most commonly used in pattern analysis. The patterns had not reached stabilization with respect to the delta channel even after the previously recommended 15-minute acclimation time. The delta pattern varied between a low of 58.9% similarity (between the 1-minute and 6-minute reading) and a high of 68.2% between the readings toward the end (between the 16-minute and 21-minute readings).

DISCUSSION

Initially this study began by using a 21-minute equilibration period. Subjects analyzed thus far to the 21-minute mark have not reached pattern stability. Therefore, a second part of the study is currently underway involving a 31-minute equilibration period. Preliminary results indicate that the commonly used acclimation period of 1 minute appears to produce the most variable thermal patterns. The chiropractor using pattern analysis based on such a reading will want to take this into account when analyzing his or her patient's spine for vertebral subluxation, and may want to consider using a longer acclimation time. Variable readings from periods where equilibration is taking place may result in erroneous analysis of vertebral subluxation. The question we hope to answer is whether, and at what time, the patterns become relatively stable.



Clinical Evaluation of Chiropractic Student Interns An Interactive Approach

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The effectiveness of teaching methods can only be measured by analyzing the end product—the student. The successful transition of the chiropractic student to the role of intern (and eventually clinician) is dependent on the ability of the student to integrate his or her knowledge in a clinical setting. Simulated case studies can be used to evaluate an individual's ability to perform in a realistic situation so that an instructor can ensure the competency of the intern and the effectiveness of various aspects of a course or program.

The goal was to develop a method of evaluating a seventh-trimester intern in a clinical setting. The instructor (clinician) needed to assess student interns' ability to perform the following: taking and recording a brief chief complaint and past medical history; formulating and executing an appropriate examination with respect to a differential diagnosis; understanding and explaining the various physical, orthopedic, and neurologic examination procedures, including normal and expected results, clinical indications, and confirmatory procedures; ordering and interpreting laboratory,

imaging, and advanced imaging studies when appropriate; referring for neurologic, orthopedic, medical, or other professional consult when appropriate; formulating a likely working diagnosis; offering an effective and appropriate treatment plan; and performing a report of findings and obtaining an informed consent.

METHODS

Student interns were evaluated either individually or in small groups of two or three. The instructor either played the role of patient or observed while a student volunteer acted as patient. Interns were told to begin by asking focused questions for which the instructor provided the answers. They were asked to provide a list of differentials, and then begin an appropriate method of examining the patient. As they proceeded, they were asked various questions with respect to expected results, and how that would alter their exam procedures and their list of differentials. Interns were allowed to select any procedure with respect to physical, orthopedic, and neurologic exams. However, they had to justify the relevance and appropriateness of each procedure. Students were then allowed to order laboratory or imaging studies. As with the history questions, the instructor provided the results or findings for each procedure.

Once the intern had satisfactorily evaluated the "patient" and formulated a working diagnosis, he or she developed a treatment protocol for the patient. The treatment plan needed

to include some form of outcome assessment and a likely prognosis. Finally, the intern needed to provide the mock patient with a report of findings and acquire an informed consent.

RESULTS

Student response to this type of program has been very positive. When asked, participants felt this was a good way to evaluate their skills and abilities, regardless of how they may have performed during the evaluation. Over time, the clinician was able to detect weaknesses not only in individual students, but in the intern population in general.

DISCUSSION

Time for this type of comprehensive student evaluation ranged from 20 minutes to 1 hour. While evaluating an individual intern was extremely effective in determining the strengths and weaknesses of that student, performing a case study for several small groups was more likely to reveal weaknesses in teaching methods. While on the surface this technique of evaluation may seem time consuming and difficult, the time allotted for each case can be controlled and adjusted by the clinician/instructor.



Examination of Variations in Dense Connective Tissue Attachments from the Rectus Capitis Posterior Minor to the Dura Mater

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The structure of dural attachments in the craniocervical region is a topic of considerable importance to chiropractic. The dense connective tissue bridge between the rectus capitis posterior minor muscle and the dura has been noted to resist dural infolding toward the spinal cord. Dural traction has been posited as a possible mechanism in cervicogenic headache. In the present study, the location and extent of myodural attachments from the rectus capitis posterior minor muscle to the posterior spinal dura is examined in 16 cadaver specimens, as the first stage in a study which will later include histological and ultrastructural analysis.

METHODS

The sample consisted of 16 embalmed cadaver specimens, obtained from the gross anatomy laboratory of Palmer

College of Chiropractic. Each specimen was dissected to expose the suboccipital triangle. The three superficial suboccipital muscles were then carefully removed, preserving the rectus capitis posterior minor muscle intact. Each specimen was further sectioned using a band saw, to produce a 2-inch wide block, which preserved the rectus capitis posterior minor in its entirety on each side. A dental saw was then used to make a midsagittal cut, extending from between the insertion of the left and right rectus capitis posterior minor at occiput, through the center of the posterior tubercle of atlas. This produced a left and right specimen for each individual. Each specimen block was then further dissected, to fully reveal the origin and insertion of the rectus capitis posterior minor. All specimens were photographed under an Olympus dissecting microscope.

RESULTS

A unilateral attachment from the rectus capitus posterior minor to the dura with no other dural attachments was identified in 11 individuals. A bilateral attachment from the rectus capitus posterior minor to the dura was found in two individuals. In one individual, the only attachment was found between the inferior border of the posterior arch of atlas and the dura unilaterally. In two individuals, an attachment from the rectus capitus posterior minor to the dura was present unilaterally, while an attachment from the posterior arch of atlas to the dura was present contralaterally. The mean length of the attachment from the rectus capitus posterior minor to the dura was 13.6 mm, with a standard deviation (SD) of 2.67 mm. The mean width was 1.1 (SD = 0.55) mm. The mean length attachments from the posterior arch of atlas to the dura was 8.8 (SD = 1.52) mm, while the mean width was 2.7 (SD = 0.38) mm. In males, the mean length and width of the rectus capitus posterior minor dural attachment were 13.3 (SD = 3.41) mm and 0.9 (SD = 0.48) mm, respectively, while in females the mean length was 13.2 (SD = 2.29) mm and the mean width was 1.0 (SD = 0.31) mm.

DISCUSSION

The results of this descriptive study indicate considerable variation in the length, width, and location of attachments to the dura at the craniocervical junction. Vertebral misalignment in the upper cervical region may place traction on the nerve-rich dura via these attachments. It is particularly during flexion that maximal traction would be placed on the dura, as flexion opens the space between the occiput and atlas. It may be hypothesized that short and/or bilaterally asymmetrical connective tissue attachments to the dura may produce increased traction, increasing the risk of cervicogenic headache. Histological factors are also likely to play a role. Future studies will focus on the histological composition and ultrastructural characteristics of these dural attachments.

CONCLUSION

Connective tissue attachments from the rectus capitus posterior minor to the dura show considerable variation both within individuals (bilateral asymmetry) and between individuals. Such variations may have clinical relevance with regard to cervicogenic headache.



A Comparison of the Responsiveness of the Neck Disability Index and the Bournemouth Questionnaire in Chiropractic Practice

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In an evidence-based age, there is a need for valid, reliable, and responsive outcome measures to document clinical change in patients. Increasingly, self-report questionnaires are being used to document patient outcomes. Unfortunately, questionnaires are not commonly evaluated for clinical responsiveness. Currently, few questionnaires are available for use in neck pain patients. Of these, the Neck Disability Index (NDI) is a commonly used and established questionnaire. The Bournemouth Questionnaire for neck pain (BQ neck) is a newly developed multidimensional instrument. The purpose of this study was to compare the clinical responsiveness of the Neck Disability Index to the Bournemouth Questionnaire for neck pain in chiropractic practice.

METHODS

Eight chiropractic practices and one teaching outpatient clinic were enrolled to recruit patients to the study. Patients

were given the NDI and the BQ neck on the first consultation (pretreatment) and at the end of the treatment program, 4–6 weeks later (post-treatment), by mail. Patients who completed both administrations of the questionnaires and reported improvement on a global improvement rating scale (post-treatment questionnaire) were included in the analysis.

Internal responsiveness (internal longitudinal construct validity) was analyzed for the BQ neck by determining the strength of the correlation (Pearson's *r*) between the change scores for each of the seven questionnaire items and the corrected total change score. External responsiveness (comparison with established measures) was tested by comparing the NDI with the BQ neck using the effect size.

RESULTS

One hundred two patients were recruited to the study. Patients' mean age was 45.4 (SD 14.81) years and 62.7% were female. Most patients (73%) experienced pain elsewhere

in addition to neck pain. Approximately 46% of patients had experienced their neck pain for more than 7 weeks and 62.7% had suffered a similar previous episode.

In terms of internal responsiveness, all seven questionnaire items for the NDI demonstrated high correlation coefficients (Pearson's r). This suggests that each item contributed significantly to the total change score in the post-treatment questionnaire and that all items of the BQ neck are responsive to patients' reported clinical change. For the external responsiveness (effect size), the BQ neck produced a considerably larger effect size (1.67) compared to the NDI (0.80). This suggests that for clinical studies, the BQ neck would require smaller numbers of subjects to

demonstrate clinically significant changes at a statistically significant level.

CONCLUSION

Both the NDI and BQ neck have now been shown to be valid reliable and responsive outcome measure for documenting patient outcomes in the clinical or research setting. This study provides evidence that the BQ neck, most likely due to its modeling on the biopsychosocial model and multi-dimensional nature, is more robust and responsive to important clinical changes in neck pain patients.



Reliability and Predictive Validity of Student Self-Assessment and Faculty Assessment of Trimester-7 Clinical Competence

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In 1995, Northwestern Health Sciences University designed a clinical competency assessment for trimester-9 interns entering the college's Community Based Internship Program. Using this competency assessment as a model, a clinical competency assessment called the "developmental assessment" was designed for the trimester-7 interns. Since the fall of 1999, it has been mandatory for all trimester-7 students to complete a developmental assessment. The developmental assessment evaluates intern cognitive, psychomotor, and affective skills, assessing how the intern thinks clinically, performs tests and procedures, and interacts with others. The developmental assessment has also been used to establish a minimum level of clinical competency for trimester-7 interns prior to their practice in the University outpatient clinic system.

The developmental assessment has evolved to a tentative format and needs to be assessed for reliability and validity. Complete data for students with record of developmental assessment ratings and NBCE Part IV scores have only recently become available. These data will be keyed and analyzed. The presentation will discuss these data.

METHODS

The student self-assessment and the developmental assessment faculty assessments are based upon a videotaped 50-minute simulated evaluation during which each intern completes a new-patient exam including diagnosis and treatment plan on a trained "patient." After the new patient evaluation, faculty raters score student performance on the

developmental assessment and may provide feedback to the intern, and written learning objectives are defined for each intern based on their performance.

Evaluation of the developmental assessment will involve: reliability assessment of each of six component subscales, as well as an assessment of the entire scale; concurrent validity evaluating controlled relationships between student self-rating and developmental assessment faculty assessment; and predictive validity evaluating controlled relationships between developmental assessment faculty assessment and National Board of Chiropractic Examiners Part IV scores (NBCE Part IV). The six components of the developmental assessment are history and differential diagnosis; examination; X-ray and laboratory; diagnosis; treatment plan; and end-of-visit and interactive skills. The NBCE Part IV exams are taken 9–13 months subsequent to the trimester-7 developmental assessment self- and faculty ratings. Reliability will be indicated by Cronbach's alpha and concurrent and predictive validity by the strength of structural regression coefficients. The data are currently being analyzed. The results of the data analyses will be presented.

DISCUSSION

Evidence of reliability, concurrent validity, and predictive validity would indicate the usefulness of the developmental assessment, and the "developmental assessment concept" to chiropractic education. Chiropractic education seeks to develop both clinical knowledge and clinical behavior. Much assessment of knowledge and less of clinical behavior is

conducted. Chiropractic is sufficiently behaviorally based to require its own instruments that assess clinic behavior. Those instruments that involve behavioral rating of clinical

activity, such as the developmental assessment, promise to strengthen a focus on behavioral learning and improve graduate performance and success.



In Vivo Motion Analysis of the Human Lumbar Spine During Spinal Manipulation

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The objective of this study was to quantify in vivo spinal motions occurring in human subjects in response mechanical force, manually assisted (MFMA) spinal manipulative thrusts (SMTs) applied to varying segmental contact points utilizing various excursion (force) settings.

BACKGROUND

Spinal motions occurring during spinal manipulation are considered important for understanding the biomechanical mechanisms, risks, and therapeutic benefit derived from the intervention. Previous work utilizing pins implanted in the spinous processes in situ and in vivo has provided only sparse data concerning the spinal motion patterns occurring during spinal manipulation.

METHODS

Four patients (two male, two female) undergoing lumbar decompressive surgery were intubated and general endotracheal anesthesia was induced. Finely threaded, 1.8-mm diameter intraosseous pins were rigidly fixed to the lumbar spinous process, and a triaxial accelerometer was attached to the pin(s). MFMA SMTs were delivered to spinal landmarks using four force settings (zero, low, medium, and high) and two force vectors (posterior-anterior; posterior-anterior, and inferior). The intraosseous and MFMA acceleration responses were recorded at a frequency of 8,192 Hz. Velocity-time and deformation-time responses were obtained from the acceleration-time histories using trapezoidal numerical integration. Descriptive statistics were performed on the acceleration, velocity, and deformation time histories, and a least-squares linear regression was performed to examine the motion coupling between the three-coordinate axes of the vertebrae.

RESULTS

For the various types of thrusts examined, MFMA forces ranged from 30 N (zero setting) to 150 N (max setting), and MFMA accelerations ranged from 689 m/s² (zero setting) to 2013 m/s² (max setting). The motion response amplitude and duration of oscillation, however, varied significantly among the four patients. In response to the MFMA SMTs the medial-lateral (ML), posterior-anterior (PA), and axial (AX) deformation ranged from 0.15 to 0.66 mm, 0.15 to 0.81 mm, and 0.07 to 0.45 mm, respectively. Thrusts applied over the transverse processes (TPs) tended to produce a more marked ML motion response in comparison to AX and PA motions, whereas thrusts applied over the spinous processes (SPs) resulted in a greater PA and AX deformation response. There was a significant amount of spinal coupling in response to the primarily PA directed thrusts applied to the SPs and TPs. For thrusts delivered to the TPs, pronounced coupling was observed between all axes (AX-ML, AX-PA, PA-ML) (linear regression, $R^2 = .36-.52$, $p \ll .001$), whereas only the AX and PA axes showed a significant degree of coupling for thrusts delivered to the SPs (linear regression, $R^2 = .82$, $p < .001$).

DISCUSSION

In vivo kinematic measurements of the human spine corroborate our previous work indicating that MFMA SMTs produce appreciable intersegmental spinal motions. Notably, spinal motions in response to SMT are dependent upon applied force, segmental contact point, and spinal morphology. Additional studies of this nature, including other forms of spinal manipulation with varying force-time profiles, are needed in both normal and pathologic subjects to help identify motion patterns that can be linked to specific pathological musculoskeletal conditions. Ultimately, more work in this area may assist in identifying thrust force/acceleration-time profiles and vectors that may maximize the putative aspects of SMT.



Chiropractic Students' Knowledge, Attitudes, and Interdisciplinary Perceptions on Caring for Older Patients

Lisa Z. Killinger, D.C., Palmer Center for Chiropractic Research, and **Marie Dusio, R.N., D.C.**, Palmer College of Chiropractic

From 1996 to 1999, the U.S. Health Resources and Services Administration offered a series of contracts to the chiropractic profession to develop, assess, and implement a "model course" in geriatrics for chiropractic students. In 1999, several pilot tests on classes of 20–40 students were conducted. In 2001, one chiropractic college has formally institutionalized the use of the "model course," utilizing it in classes of 140–210 students. The instructors are conducting pre- and postassessments to study this course's ability to enhance student knowledge, attitudes, and interprofessional perceptions.

The obvious challenge is to determine whether the successes seen in pilot tests of the "model course" (taught to groups of 20–40 students) can be retained as this course is taught to classes 7–10 times the size of the pilot studies. This presentation summarizes the results of the assessments, and contrasts these results to earlier pilots and similar studies of other health professional students in geriatric training. Qualitative data will also be gathered to assess how the course's emphasis on wellness and prevention (rather than the more traditional disease and symptom approach) has impacted students' attitudes about their role as health care providers for the older population.

METHODS

Pre- and postassessments were done on all 120 students in the course, including the Palmore Facts on Aging Quizzes, Perceptions on Professions questionnaires, and the Aging Semantics Differentials. In addition, a brief essay question will obtain qualitative information on students' perceived role in offering health promotion and prevention for older patients. Data from this study will be compared to the published work of Hawk, Killinger, and Byrd on the knowledge, attitudes, and interdisciplinary perceptions of various health professional students.

RESULTS

Preassessments on the level of knowledge on aging issues indicated that this class of chiropractic students had quite similar knowledge and attitudes to other health professions students and students in previous pilot studies. Specific data on the postassessments of this course and the final comparisons of this cohort to other professions will be presented, along with qualitative data on students' perceptions on health promotion and prevention.

DISCUSSION

The information gathered and lessons learned through the institutionalization of this course can be used to refine and revise chiropractic geriatrics training programs. However, the challenges of teaching this model in lecture halls of nearly 200 students are significant indeed. The use of this model of training is the fruit of multiple years of study of chiropractic geriatric education, course development, and pilot testing. Based on the literature on aging and education, we feel that in chiropractic education, an interdisciplinary focus on "wellness" and health promotion and prevention is appropriate and consistent with the Healthy People 2010 objectives. Utilizing case-based, evidence-based, and community-based methods in a student-directed learning environment, as was done in this course, also appears to be consistent with the educational literature.

CONCLUSION

The data gathered through this project should be followed by further studies of students' perceived roles on health promotion and prevention in chiropractic geriatric practice. Although experiential courses such as this one are labor intensive, we feel it is certainly worthwhile to help students gain the confidence and skills required to deliver competent chiropractic care to meet the health care needs of our graying planet.



The Interdisciplinary Preceptorship Experience A 3-Year Follow-up

Lisa Z. Killinger, D.C., Palmer Center for Chiropractic Research

In 1997, the U.S. Health Resources and Services Administration (HRSA) funded the development of an interdisciplinary preceptorship program at a chiropractic college. A manual was developed from this project and distributed to all chiropractic college clinics to share information on developing interdisciplinary chiropractic preceptorship programs. This presentation summarizes the results of a survey and assessment of over 800 preceptorship doctors, relative to their interdisciplinary practice status, and their interest in interdisciplinary issues/education. It also reviews the pre- and postresults of the assessment and forms completed by the students who completed interdisciplinary preceptorships over the past 3 years. Suggestions for future research and program development in chiropractic interdisciplinary education are made also.

This program development project began through a survey of 800+ existing preceptors to determine whether their practices had some level of interdisciplinary collaboration. Once

identified, students who entered into interdisciplinary preceptorships were interviewed prior to their experience about their expectations, and completed an assessment of the perceptions of their role on interdisciplinary teams, and their general perceptions of other health professions.

Now, 3 years later, each student who completed interdisciplinary preceptorship will complete an interview to obtain information on their retrospective views on the interdisciplinary experience, and whether they are currently in an interdisciplinary or multidisciplinary practice. The assessments they completed prior to their preceptorships will be re-administered to see how their views may have changed over the 3-year period. Results of the pre- and postassessments and a comparison of their interviews will be made. This information will be used as background knowledge for the further implementation of interdisciplinary clinical experiences for chiropractic students.



The Prevalence of Depression Among Chiropractic Students

Stuart Kinsinger, D.C., F.C.C.R.S.(C), Canadian Memorial Chiropractic College

The occasional feeling of sadness is considered a normal part of life, and most cope and carry on with normal activities of daily living. Sadness is most often experienced over grief and loss events and subsides after a period of time. Studies reveal that 25–30% of all people suffer some form of an excessive mood disturbance during their lifetime and 10% require professional help. Studies also reveal that certain populations are predisposed to depressive disorders, including adolescent and young adult females and medical students of both genders. Considerable study has been given to students studying medicine because of the significance of the problem in that population, with some theory but little consensus having been developed. No study has focused on the chiropractic student population.

Anecdotal reports from Student Services departments in various chiropractic colleges reveal a trend to depressed mood in students as they progress through their years of study. As in medicine, chiropractic students have indicated that the quantity and quality of content they are expected to learn as part of their professional studies is difficult and disadvantageous to their mental and physical health.

The purpose of this study was to measure and assess the level of clinical depression in a chiropractic college student population.

METHODS

This study used a cross-sectional survey to assess the prevalence of depression in each class in the 4-year chiropractic program. It was inclusive to all students and was designed for a minimum participation of two-thirds of each class. The instrument used was the 21-item Beck Depression Inventory II (BDI-II), a reliable, sensitive, diagnostic tool. Statistical scrutiny has rated the BDI-II as valuable for assessing all of the various components of depressive disorders including trait measures, and not just the subject's current state.

The Principles Department cooperated with the researchers by allocating 30 minutes from a course in each of the 4 years in the same week of the curriculum. None of the classes involved a major examination scenario that week or

the next. Instructions regarding volunteering to participate, potential risks in completing the form, and keeping the assessment anonymous were given orally and then visually on the projection screen at the front of the lecture room for the entire 30 minutes. The study was described using the term “assessment of mood” and not “depression.”

RESULTS

Severity of depression was measured by a point total on each BDI-II, with 0–13 being “minimal”; 14–19 “mild”; 20–28 “medium”; and 29–63 “severe.” The total population showed that out of 485 subjects, 376 scored minimum, 62 mild, 35 medium, and 12 severe. The “severity per year” data revealed the greatest severity was in the second year of study, and females scored slightly higher, with a mean score of 10.6 compared to 8.5.

DISCUSSION

This study is the first of its kind to be performed on chiropractic students. Anecdotally, the second year of study is considered by all stakeholders to be the most intensive. The high level of difficulty with regard to amount of course content is also considered by most faculty to be one factor influencing mood.

CONCLUSION

Chiropractic students have a measured level of depression that is less than medical students and similar to the general population. The next step in this research is to verify this completed study and compare these results with the chiropractic field practitioner population.



Disruptive and Excessive Talking During Lectures Towards an Understanding of a Recent Phenomenon

Stuart Kinsinger, D.C., F.C.C.R.S.(C), Canadian Memorial Chiropractic College

In the very recent past (5–10 years), an observed pattern of behavior has emerged at our chiropractic college during many of the large class lectures: excessive and disruptive talking among students. This trend has been observed and noted anecdotally by faculty, students, and guests. All agree that the trend reveals an increase in both noise level and duration of talk. The purpose of this evaluative study was to ask the students to provide information about this phenomenon, as they were one group to identify the issue as having a potential negative influence on their learning.

METHODS

A 27-question survey was administered to the first-year class, and was divided into three sections: 1 through 7 was self-identification and opinions on the “why”; 8 through 25 were questions to be answered on a 5-point scale (agree strongly, agree somewhat, undecided, disagree somewhat, disagree strongly); and 26 and 27 were for written comments, with one question being open ended and the other closed. The answers were penciled in on bubble sheets and analyzed using the PET software program. All replies were anonymous to both faculty and colleagues.

RESULTS

Ninety students participated. The “Primary Reason” for disruptive and excessive talking was given as follows: lack of

interest in the lecture topic, 59%; lack of self-control, 21%; lack of respect for the lecturer, 16%; and “Cultural,” 2%. Sixty-eight percent of students agreed that disruptive talking was “a problem for me and/or my learning in class” and 56% agreed that the institution should deal with the problem. Some questions dealt with the location of the offenders, with the rear and sides of the lecture hall being identified. Sixty percent agreed that this problem was worse than that experienced at their undergraduate university experience. Forty-one percent agreed that disruptive talkers should be identified, but there was less agreement on disciplining students with regards to remediation or a course mark penalty. There were three provocative questions used, with the first question being “I see myself as a student who talks excessively in lectures” with only 3% agreeing to this self-identification. Ninety percent disagreed with the statement “Students are entitled to talk in lectures if they want to,” but 35% of the class agreed that “Mandatory attendance policies are legitimate reasons for talking in class.”

DISCUSSION

Casual discussions among chiropractic college faculty reveal a general lack of understanding of why this issue has become noticed in an increasing way. The students themselves have indicated that their primary reasons are a lack of interest in the content presented and a lack of self-control. Areas of further study include the role of different courses,

the influence of “entitlement”-based early education, and the views of faculty.

This initial evaluation of this recent phenomenon gives additional areas for further exploration, including a deeper understanding of why an above average, highly skilled, academically inclined student would enroll in a professional

college and sit at the side or back of the lecture hall and talk with other students in a disruptive way. Faculty and administrators are seeking to understand if the course content and load influence this. Lecturers are wondering if note service and attendance policies have an influence. All stakeholders desire to know if this problem is amenable to correction.



A Comparison of Cervical Axial Rotation in Upright Seated and Supine Postures

Charles A. Lantz, D.C., Ph.D., Life University, and **Thanh Luu, D.C.**

Cervical range of motion is an important and established aspect clinical practice for spine physicians. However, little attention has been paid to details of procedures used. Reliability studies generally lack rigor and often report inappropriate statistics. The current “gold standard” is dual inclinometry, but there are only two studies which have evaluated this technology for cervical spine measurements. Studies in the lumbar spine found poor reliability for axial rotation. No studies have reported on differences between inclinometric measurements in the upright posture (lateral bending and flexion/extension) versus the supine posture (axial rotation). The tacit assumption is that both types of studies provide equivalent information.

While inclinometric measurements must be made against gravity, one plane at a time, newer spinal motion technologies, such as electrogoniometers and ultrasound tracking systems, permit measurement of all planes of motion simultaneously without requiring different postures. This allows all planes of motion to be evaluated from an upright neutral posture. In addition, with these newer technologies, subjects can be monitored continuously during activities of daily living. It is necessary, however, to establish reliability and validity for the newer technologies. Earlier work suggested that supine cervical rotation was quantitatively different from the same motion in an upright posture. The purpose of this study was to determine the differences in ranges of motion in the two postures.

METHODS

Thirty subjects were evaluated for cervical rotation under five different conditions: upright active and passive (electrogoniometer) and supine active and passive (inclinometer) using a sternum reference and supine active (inclinometer) using a horizontal, fixed reference. Lateral bending and flexion/extension were also determined in the upright posture simultaneously with the electrogoniometer and dual inclinometer.

RESULTS

Cervical axial rotation was greatest with subjects supine using the horizontal (bench) reference, exceeding active

upright motion by 26° and supine active motion with a sternal reference by 19°. Supine active and passive motion (sternal reference) were greater than the corresponding upright motions by 8° and 11°, respectively. Passive motion was greater than active by 11° upright and 13° supine. The differences between inclinometry and electrogoniometry for lateral bending and flexion/extension were only about 1°. Measurement errors (SD) for all motions were less than 3°. Upright passive axial rotation was not significantly different from supine active axial rotation ($p = .2-.6$). All other axial rotation comparisons showed significant differences ($p < .001$).

DISCUSSION

This study demonstrates that supine cervical rotation is quantitatively different from upright motion measurements and further suggests that they may be qualitatively different as well. Our study revealed significant problems with the supine measurement protocols, such as the type of table used and lack of a standardized protocol. Although it is assumed that subjects are relatively immobilized in the supine position due to gravity and mechanical constraints, there is, in fact, considerable movement of the thorax with supine rotation, more in some subjects than in others. Overall, it is questionable whether supine measurements of axial rotation compare with upright measurements of lateral bending and flexion/extension. It is likely that in the supine position, certain proprioceptive mechanisms are released, allowing greater range of motion than in the upright, gravity-bearing posture.

CONCLUSION

Inclinometric measurements of axial rotation with subjects supine are substantially greater than those with subjects upright (up to 60° for total motion). It is recommended that supine cervical rotation measurements be performed

using dual inclinometry with the reference stabilized on the sternum to compensate for thoracic movement, and that the results of supine axial rotation measurements be

interpreted with caution. The results presented suggest the presence of a “proprioceptive space” which is accessed when patients/subjects are supine.



Facing Issues in the Delivery of Instruction Through Interactive Video Conferencing

Elizabeth D. Larzelere, B.Sc., and **Margaret M. Finn**, B.Sc., R.N., D.C., M.A.T., New York Chiropractic College

New York Chiropractic College (NYCC) has made a commitment to using interactive video conferencing to facilitate adoption of the new NYCC curriculum. This curriculum was designed to allow for a more enriched educational experience, including the addition of elective courses and the extension of the clinic rotations. These changes dictated that NYCC implement video teleconferencing as a course delivery method to ensure that the entire student body (including those interns at the outpatient health centers) could benefit from these changes. This is a thumbnail view of the administrative, delivery, training, and technical challenges faced when implementing interactive video conferencing.

METHODS

The NYCC Educational Technology Committee coordinated the details involved in implementing interactive video conferencing. A timeline was developed to synchronize and track the various activities. Site visits to other interactive video conferencing facilities proved to be very informative. A tremendous amount of time was spent addressing needs assessment; engineering, design, construction, and testing; faculty development; reference materials; interdepartmental communication; and copyright and intellectual property issues.

ISSUES

The implementation of interactive video conferencing posed some unforeseen challenges. We underestimated the demand on staff resources at all the sites as well as the distribution of printed materials. Startup of every session requires on-site staff to make certain the high-tech equipment was performing properly.

Delivery is somewhat different in an interactive video conferencing situation. Actively involving the students early and often using small group work, activities, reading and

writing, discussion and questions were found to best get them out of the passive “viewing” mode, making them feel apart of the “community.”

Initial training to faculty and staff was provided. Various articles and websites interactive video conferencing techniques and suggestion were shared with the faculty. Practice sessions for those using the rooms were encouraged. Unfortunately, there wasn't as much “practice time” as was originally planned.

There was a company strike, which delayed the final hook-up at one of the sites. Backup methods of videotapes and on-site faculty presentations helped fill the gaps until this was cleared up to ensure consistent and quality instruction. There were numerous “drops” (meaning one of the sites needed to be reconnected to continue). The cause was later identified as a combination of cabling and equipment issues, which created another challenge for the presenting instructor and the tech support staff.

DISCUSSION

There have been modalities employed as well as some interesting outcomes. Faculty with certain “expertise” can easily share by hosting from different sites. Guest speakers vary the host site. Students in one course self-selected the mode of delivery (live, on-line, or video conferencing). Two core courses are utilizing a “campus portal” (NYCC On-line - Mascot) to disseminate some of the information for their courses. Students conversed intersite during breaks and before and after classes, which contributed to the cohesiveness of the “class.” Internet resources were more readily utilized. NYCC utilizes this interactive video conferencing capability for meetings, training sessions, and postgraduate and guest speakers. In the future, we are planning to use interactive video conferencing for colloquium, student recruitment, collaborative course offerings with other institutions, alumni events, counseling services, and opening it for community use.

NYCC has faced the many delivery issues as we implemented interactive video conferencing. Dealing with those

issues allowed for realistic suggestions and resolutions as problems were identified. Our institution intends to increase the scope for which we use interactive video conferencing and know that as we expand utilization of these capabilities,

we will be continually challenged. The experience we have acquired during implementation helps us avoid negative situations and increases the effectiveness of this technological means of delivering our new curriculum.



Diets and Physical Fitness

David C. Lin, Ph. D., FACN, and **Gene S. Tobias**, Ph.D., D.C., Southern California University of Health Sciences

The Food Guide Pyramid published by the U.S. Department of Agriculture classifies foods into six groups. Since the energy level per serving from each food group differs, the frequency of consuming a particular food group could affect the physical condition of a person. A possible correlation between the daily number of servings of a food group and the body mass index (BMI) or the waist-hip ratio (WHR) of a person was investigated. Also investigated was the correlation between the daily numbers of servings of any two food groups.

METHODS

Forty-three college students (32 males and 11 females), 20–30 years of age, participated. They were taught the techniques of anthropometry, the Food Guide Pyramid, and the serving size of each food group with food models. They were then paired and measured each other's anthropometric parameters. Each one filled out a 24-Hour Dietary Recall form. The number of servings of each food eaten was transferred to the proper food group of a Food Guide Pyramid form. The significance of the Pearson correlation (r) between the following pairs of parameters was computed: BMI and WHR, BMI or WHR and the daily number of servings of a food group, or the daily numbers of servings of any two food groups.

RESULTS

A statistically significant positive correlation was observed between the following two parameters. For the gender-combined group, they are BMI and WHR ($r = .570$, $p = .000$), WHR and Bread-Cereal-Rice-Pasta ($r = .316$, $p = .039$), Bread-Cereal-Rice-Pasta and Milk-Yogurt-Cheese ($r = .392$, $p = .009$), and Vegetable and Meat-Poultry-Fish-Bean-Egg ($r = .308$, $p = .045$). For the males, it is BMI and WHR ($r = .518$, $p = .002$). For the females, they are BMI and WHR ($r = .785$, $p = .004$), BMI and

Milk-Yogurt-Cheese ($r = .693$, $p = .018$), Bread-Cereal-Rice-Pasta and Milk-Yogurt-Cheese ($r = .702$, $p = .016$), and Meat-Poultry-Fish-Bean-Egg and Vegetable ($r = .858$, $p = .001$).

DISCUSSION

Although BMI has been widely used as an indicator of adiposity, it cannot differentiate between the high muscle and high fat levels of a person. However, the strong positive correlation between the BMIs and WHRs observed in this study suggests each of these two parameters can reflect the adiposity of the subjects studied. The significant positive correlation between WHR and Bread-Cereal-Rice-Pasta observed for the combined group suggests one can easily obtain unwanted additional energy from Bread-Cereal-Rice-Pasta foods. This is in agreement with the results of human overfeeding experiment. Possibly Bread-Cereal-Rice-Pasta foods are readily available and are emphasized in the Food Guide Pyramid (6–11 servings per day). The positive correlation observed between the numbers of servings of Bread-Cereal-Rice-Pasta foods and Milk-Yogurt-Cheese foods could reflect the common behavior of eating starchy foods with dairy products, such as breads served with milk. This could also explain the positive correlation between the female BMI and their daily intakes of Milk-Yogurt-Cheese foods. Females are more likely to get extra energy from Milk-Yogurt-Cheese foods than males due to their desire to obtain more calcium for preventing osteoporosis, a disease that occurs more often in females than males. The significant correlation between the numbers of servings of Meat-Poultry-Fish-Bean-Egg and Vegetable foods could also reflect the common behavior of eating meats or fish with vegetables.

CONCLUSION

Present results suggest starchy foods (bread, cereal, rice, and pasta) and possibly dairy products could be readily available sources of extra energy that contribute to overweight, while vegetables and protein foods (meat, fish, etc) are not.



The Distribution of Responses on Two Different Versions of the Oswestry Low Back Disability Questionnaire A Retrospective Study

Natalia Lishchyna, B.Sc., D.C., and **Judith Waalen**, Ph.D., Canadian Memorial Chiropractic College

There are several versions of the Oswestry Low Back Pain Disability Questionnaire (Oswestry) in use by health care professionals who treat low back pain patients. Modifications and revisions have been made by others to increase the applicability to the less disabling forms of low back pain so that the baseline scores were higher, and more sensitive to change. Wording changes were also made to conform to North American terminology. The two versions used in this study differed in several respects—the detractors are not the same and two items (sex life and changing degree of pain) do not correspond. This study reports the distribution responses of two different versions of the Oswestry of patients presenting to a teaching chiropractic outpatient clinic.

METHODS

Two hundred charts of patients aged 18–90 years were examined. One hundred charts contained the modified Oswestry (M-Oswestry) (1986). The other 100 contained the revised Oswestry (R-Oswestry) (1989). Demographic data contained in the charts and Oswestry raw scores of each item were extracted.

RESULTS

The M-Oswestry sample was composed of approximately equal numbers of men and women. In the R-Oswestry sample, there was a slight male predominance (59%). The M-Oswestry sample was slightly older with an average age of 40.3 years (SD = 17.6) as compared to an average age in the R-Oswestry of 37.1 years (SD = 14.0). The top three diagnoses in both samples were lumbar facet dysfunction, sacroiliac dysfunction, and lumbar myofascial strain.

The means of the M-Oswestry and R-Oswestry were calculated to be 11.68 (SD = 8.12) and 15.51 (SD = 9.11), respectively. A one-way analysis of variance confirmed that the means of the two versions were different from one another

(F ratio = 9.846, p = .002). There was a significant difference in the mean disability scores between men (X = 9.96, CI 7.99–11.92) and women (X = 13.54, CI 10.97–16.10) in the M-Oswestry group only (F = 5.047, p = 0.027). When comparing the presence or absence of radiating pain, those using the M-Oswestry did not significantly differ in the Oswestry scores (F ratio = 2.50, p = .117). In contrast, those taking the R-Oswestry showed significant differences in the mean (F ratio = 5.78, p = .018). Those with radiating pain had a mean score of 19.2 (CI 15.1–23.1), while those without radiating pain had a mean score of 14.1 (CI 12.1–16.2). The Oswestry means of acute and chronic patients did not differ significantly in either version. The Oswestry means of those with a previous history of low back pain were not significantly different from those without a history of low back pain, regardless of version.

DISCUSSION

The most recent version, R-Oswestry, seems to have higher perceived disability baseline scores. This would appear to be the preferable instrument to use in clinical trials due to its wider applicability to the type of low back pain seen in a chiropractic clinic. In previous studies, the Oswestry has been found to be more applicable to chronic low back pain patients. We did not find this to be the case. We did find that there was gender difference in the M-Oswestry version, and we were able to replicate previous study results of increased disability scores due to low back pain reported by women. Our results also supported a previous study finding that the low back pain patients with radiculopathy tended to score higher on the R-Oswestry version.

CONCLUSION

Item differences seem to influence responses, so that knowing which version of the Oswestry is used is critical in understanding the extent of disability.



Chiropractic Spinal Manipulation for Cervicogenic Headache in an 8-Year-Old

Anthony J. Lisi, D.C., and Yolanda Dabrowski, D.C., Palmer College of Chiropractic West

The diagnosis of cervicogenic headache has been controversial. Recently, however, some authors have been more definitive in accepting the diagnosis of cervicogenic headache based upon specific criteria. Presently the prevalence of cervicogenic headache in adults is not clear. Studies have suggested numbers ranging from 0.4% to 17.8%. It appears that no data on the prevalence of cervicogenic headache in children have been published. However, chronic or recurrent headache in general has been stated to occur in as much as 40% of children by 7 years of age, and 75% of children by 15 years.

There is evidence that spinal manipulation is effective in the treatment of cervicogenic headache in adults. However, there is no evidence of the effectiveness of spinal manipulation in the treatment of cervicogenic headache in children.

The purpose of this paper is to describe a case of cervicogenic headache in an 8-year-old boy that improved after chiropractic spinal manipulation. This appears to be the first such case described in the literature.

METHODS

This case report involves an 8-year-old boy presenting with daily headaches of greater than 3 years duration. The patient

met the diagnostic criteria for cervicogenic headache. The patient was treated with spinal manipulation, primarily of the upper cervical region, and ancillary myofascial release.

RESULTS

A significant decrease in headache frequency was seen after the first treatment. After four treatments, the headache frequency decreased to approximately one per month. The patient was followed for 2 months after termination of care and reported headache frequency of approximately two per month.

DISCUSSION AND CONCLUSION

There is evidence that spinal manipulation is effective in the treatment of cervicogenic headache in adults. This appears to be the first report of spinal manipulation for headache meeting the cervicogenic headache diagnostic criteria in a child. Since headache in general is a common complaint in children, this may be an area warranting further investigation.



A Pilot Study of Provocation Testing with Pelvic Wedges Can Prone Blocking Demonstrate a Directional Preference?

Anthony J. Lisi, D.C., Robert Cooperstein, M.A., D.C., Palmer College of Chiropractic West, and **Elaine Morschhauser, D.C.,** Palmer College of Chiropractic

Currently, no traditional chiropractic examination method to determine a listing (and subsequent direction of manipulation) has been shown to have a bearing on clinical outcome. Provocation testing, an examination method that does give guidance on the direction of manipulation, has been shown to relate to outcome. Provocation testing is an assessment of patient symptoms in response to an applied load, such as would be applied by a given manipulative procedure, but without any element of thrusting. The patient response to provocation testing either supports or refutes the appropriateness of the given adjustive procedure.

Subjects may exhibit a directional preference upon mechanical (McKenzie) examination of the spine. This is described as a direction of motion that produces a beneficial change in symptoms. Furthermore, the opposite motion almost always produces a worsening of symptoms. Several authors have shown that using directional preference to guide treatment of low back pain patients has led to improved clinical outcomes.

Cooperstein, based on untested clinical experience, described a novel application of a traditional chiropractic examination procedure. This is a diagnostic protocol using

pelvic wedges (blocking) to assess changes in patient pain or tenderness, and to derive manipulative strategies from such.

It may be possible that existing chiropractic examination methods can be refined to include elements of provocation testing and directional preference. Ultimately, this may lead to examination methods which can have a positive influence on treatment outcome.

Provocation testing and assessment of directional preference typically appraise symptoms in symptomatic subjects. Prior to studying the above protocol on subjects with significant symptoms, we have decided to measure a sign (tenderness) in asymptomatic or minimally symptomatic subjects.

The purpose of this project is to determine if lumbosacral tenderness measured by algometry will change in response to varying positions of pelvic wedges under a prone subject.

METHODS

Subjects were 20 asymptomatic or minimally symptomatic students, defined as current low back pain of 2 or less on a 0–10 pain rating scale. Subjects were questioned as to prior history of low back pain and/or trauma.

Subjects were placed prone on a pelvic bench. Baseline measurements were taken using a pain pressure threshold algometer from each of the following points: left PSIS, right PSIS, left lumbosacral joint, right lumbosacral joint. A pair of padded wedges was then placed under the subject, in each of four positions in the following order: left iliac crest, right greater trochanter; right iliac crest, left greater trochanter; left and right iliac crests; left and right greater

trochanters. Algometric readings were taken at each of the four monitoring points after each position. At the conclusion, algometric readings were taken with no wedges in place.

RESULTS

Data collection is in progress. Preliminary results suggest that tenderness decreases or increases in response to various blocking positions. Also, the blocking positions that increase or decrease tenderness are typically diametrically opposed; that is, directional preference can be shown.

DISCUSSION

It appears that low back tenderness can change in response to various positions of pelvic wedges, and that a preferred blocking pattern can be determined. Future research is needed to determine interexaminer reliability, test–retest reliability, and differences in clinical outcomes based upon this examination finding.

CONCLUSION

It appears that pelvic wedges can be used for provocation testing of low back tenderness and assessment of directional preference in asymptomatic or minimally symptomatic subjects.



False-Positive and False-Negative Errors in Chiropractic Clinical Intern Radiological Reports

Tracey A. Littrell, D.C., Palmer College of Chiropractic

A requirement of imaging procedures is the accurate interpretation of those images and the production of a written radiological report.

METHODS

In order to evaluate the interpretation skills of chiropractic clinical interns, a study was done that compared the interns' initial written radiological reports to the radiologist's or radiology resident's final written reports. Any statement within the interns' reports that differed from the radiologists' reports was marked as an error. Errors were classified as either

errors of omission (false-negatives) or errors of commission (false-positives) and were further subdivided into errors of alignment findings, bone findings, cartilaginous findings, soft-tissue findings, failure to search errors, and discrepancies of terminology.

RESULTS

Previous studies that analyzed interpretation errors committed by medical health care providers reported a ratio of 73% errors of omission to 27% errors of commission. This

study reports an error of omission to error of commission ratio of 66%:33%. The most frequently omitted radiographic findings were those of alignment issues, such as hypolordosis and hyperlordosis, anterior and posterior weightbearing. The most frequent errors of commission (overcall) were those involving bone findings, such as the interpretation of normal vertebral anatomy as degenerative.

CONCLUSION

These findings can serve as important markers in identifying strengths and weaknesses within the education of chiropractic students in both the classroom and within the clinical setting. Strategies for improving an intern's interpretive skills are discussed.



Development of a Web-Based Data Coordinating System

Cynthia R. Long, Ph.D., **Scott Morschhauser**, B.S., and **Lance Corber**, B.A., Palmer Center for Chiropractic Research

The need for increased methodological quality in the conduct and reporting of randomized clinical trials (RCTs) has received deserved attention over the past few years. RCTs of chiropractic are also held to this standard. Issues regarding data handling and treatment assignment, in particular, can be handled within standardized protocols, enhancing methodological aspects of RCTs. This paper describes the process of developing a web-based data coordinating system at a chiropractic research center.

METHODS

A prototype for an intranet windows-based data coordinating system was developed. The modules were as follows: 1) computer aided telephone interview database; 2) on-line in-person screening and exit interview interfaces; 3) electronic clinical research forms; 4) treatment assignment; and 5) monitoring data collection form status.

The system was programmed in MS Windows using MS InterDev and MS Access as the database engine. The modules in this system were then customized for an internal pilot RCT. Network access was limited to designated personnel, and further security was gained by having the system password protected with an accompanying electronic log. The first three modules were ready extensions to existing applications. The treatment assignment module was created by storing a predetermined restricted randomization schedule in a table of the study database; a treatment allocation interface allowed the study coordinator to access and make treatment assignment just as if sequentially numbered envelopes were used, assuring the allocation sequence was concealed until the interventions were assigned.

An especially innovative feature to this system was the development of "Packet-Trackit" to monitor data collection forms, as well as to facilitate quality control checks for

form completeness and consistency. This, coupled with the electronic data collected in the first three modules, allowed for regular reports of "real-time" study flow to be generated.

RESULTS

Due to the success of the intranet data coordinating system, this was moved to a web-based platform for use in an upcoming RCT at a site remote to the center. The workload for the change was in reprogramming the interfaces in web-based languages, and transferring between test and production web servers. The final web-based system for the upcoming RCT has three modules: 1) remote data entry of screening data; 2) "Packet-Trackit"; and 3) treatment assignment. The first module will facilitate timely recruitment reports. "Packet-Trackit" was customized to the data collection protocol for this study. The treatment assignment module was enhanced to provide the complex allocation algorithm, which must be done in real-time via a computer program, proposed for this RCT. Other enhancements include customized queries to generate real-time study flow reports at any given time.

DISCUSSION

This process is an example of how chiropractic research center personnel can make efficient use of limited college resources to systematically develop a flexible system. This system allows for data handling and treatment assignment to be accomplished using standardized, sophisticated methods for multiple RCTs at any given time. This will facilitate timely completion and reporting of RCT results, as well as increasing the overall methodological quality of the RCTs.



Empowerment of Chiropractic Faculty A Profile in Context

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The primary resource base and core human capital in chiropractic education is found among its faculty. The chiropractic profession depends on a professional faculty for continuous quality improvement and innovation in areas of curriculum, scholarship, and practice. Assessing attitudes of faculty empowerment informs executive decisions related to faculty development and creation of a supportive work environment.

OBJECTIVE

The goal of this exploratory research is to provide an initial understanding of empowerment among faculty in the organizational context of chiropractic education, to construct a profile of perceived faculty empowerment, and to inquire into potential associations between perceived empowerment and faculty demographic and workplace characteristics.

METHODS

Surveys were distributed to full- and part-time faculty working in the United States and Canada. The survey was composed of Spreitzer's multidimensional measure of psychological empowerment and additional items designed

to measure faculty demographics and workplace variables, including academic rank; years at the institution; years in higher education; sex; age; area of assignment; employment status; and academic rank. Descriptive statistics and multivariable analysis were used to describe and explain any associations between the respondent characteristics and empowerment scores.

RESULTS

More than 54% of the study population ($N = 609$) completed and returned the instrument. The respondents were typically male (68.4%) and employed full-time (81.6%). Almost half (47.5%) of the respondents were assigned to the area of patient care at their institution. Area of assignment and employment status emerged as important variables for explaining the variance in dependent variable scores.

CONCLUSION

The findings of this exploratory research provide a basic profile and some initial perspectives of empowerment in the context of the work environment of the chiropractic profession's learning institutions.



Success in Chiropractic Practice A Practitioner-Based Content Analysis

Brian J. McAulay, D.C., Ph.D., **Susan Newlin**, B.A., **Edward Owens**, M.S., D.C., Sherman College of Straight Chiropractic, and **Daniel Lemberger**, D.C.

Although there has been much recent emphasis in the popular chiropractic press questioning the ability of recent chiropractic college graduates to survive and succeed in an increasingly competitive and regulated health care environment, there has been little empirical analysis of the components of success in practice. This study is a content analysis of what alumni of one chiropractic college consider to be important dimensions and competencies of practice success.

METHODS

Six hundred randomly selected graduates of a chiropractic college, in practice between 1 and 25 years, were asked to provide information on an open-ended survey to explore the necessary components of successful chiropractic practice. Content analysis methods were employed to identify and categorize both identifiers of practice success

and competencies required to achieve success in practice. Each respondent was asked to identify up to six characteristics of successful chiropractic practice and up to two competencies for each of these characteristics. A competency is defined as a specific skill or attitude which one would need to possess to fulfill the identified characteristic. In all, 942 characteristics and competencies were identified by respondents. Following standard content analysis protocol, three researchers concurrently and collectively categorized all survey responses, and resolved discrepancies to reach consensus. Three iterations of categorization occurred. During the first iteration, researchers developed categories based on the respondents' comments. During the second iteration, researchers recategorized each response where appropriate. The third iteration consisted of a final review of all responses, with a small number of recategorizations.

RESULTS

Twelve categories of practice success were identified. The top three were attributes/skills of the chiropractor, business acumen, and clinical skill. Researchers broke these three categories into subcategories to isolate more precisely the components of success. Under attributes/skills of the chiropractor, there were eight subcategories: personal characteristics/traits, interpersonal skills, confidence/belief in chiropractic, knowledge, an attitude of service, enjoyment of practice/happiness, personal organizational skills, and personal health. There were five subcategories of business skills: human resources, marketing, office procedures, fees, and finance. There were also three subcategories of clinical skills presented by respondents: adjustments/technique,

results, and analysis. Researchers developed a survey instrument based on the findings of this study to determine the extent to which field practitioners felt they were properly trained in 19 of these dimensions. Following survey development protocols, the authors generated multiple items per dimension, resulting in the preparation of a 57-item "Success in chiropractic practice" measure. This instrument will be tested on another sample of practicing chiropractors for evaluation of validity and reliability, in the near future.

CONCLUSION

This study made a first, and important, attempt to quantify what is meant by "success" for practicing chiropractors. This study contributes to the literature by providing a framework for analysis of this phenomenon. Preliminary results suggest that, in line with the entrepreneurial literature, the personal characteristics and skills of the chiropractor him/herself are considered to be essential antecedents of success. In addition, and in accordance with reports in the chiropractic press, business skills are noted as being particularly integral to success. For chiropractic colleges, these findings indicate the importance of the provision of interpersonal (and other personal developmental) skills, and business acumen in their curricula. In addition, this study supported the notion that it is not income, but service (represented by the notion of practice volume, seeing many patients), that drives successful practices. Finally, the fact that practitioners see faith and confidence in chiropractic as a key component of success suggests that development of this confidence should be an important part of the education of chiropractors.



The Health Insurance Portability and Accountability Act of 1996 Standards for Privacy of Individually Identifiable Health Information (45 CFR Parts 160 and 164) and Chiropractic Colleges, Their Clinics, and Research Facilities

J. Clay McDonald, D.C., J.D., and **Robert T. Bernat**, M.D., J.D.

In 1996, Congress mandated the establishment of the first national standards for the privacy of individually identifiable health information by enacting the Health Insurance Portability and Accountability Act (HIPAA). Standards of Privacy of Individually Identifiable Health Information (45 CFR Parts 160 and 164) are generally referred to as The Privacy Rule. The cost of implementing the HIPAA privacy and security regulations to the health care industry is estimated at \$40 billion over the next 2 years. This presentation will reveal the significant impact HIPAA, and The Privacy Rule, will have on chiropractic colleges, their clinics, and research facilities. The primary objective of the presentation is to

increase awareness, stimulate dialogue, and encourage early preparation among the chiropractic colleges, their clinics, and research facilities. Secondarily, the presentation is aimed at reducing anxiety and misinformation within the chiropractic community. The team presentation is based on a critical review of HIPAA, specifically The Privacy Rule, the Department of Health and Human Services (HHS) commentary on The Privacy Rule, and an analysis of the current literature. The critical review led not only to this presentation but also to the development of a HIPAA Survival Package for Chiropractic Institutions and Practices.

The presentation will consist of the following parts:

1. A brief history of the political, social, professional, and industry concerns that brought about HIPAA and The Privacy Rule and what the Act is trying to accomplish
2. HIPAA and The Privacy Rule: what it says and doesn't say
3. Who is covered by HIPAA and why?
4. How soon must those covered entities come into compliance with the act?
5. What constitutes compliance? How and when may protected information be used or disclosed?

6. How do chiropractic colleges and individual practitioners assure compliance?
7. Repercussions of noncompliance
8. Additional resources on HIPAA, The Patient Privacy Rule, electronic transmission of patient data, and compliance will be reviewed.

The presentation will be accompanied by handouts giving additional insight into HIPAA, The Patient Privacy Rule, and compliance.



Continuous Voice Dictation in a Chiropractic Radiology Educational Setting

Ian D. McLean, D.C., D.A.C.B.R., Palmer College of Chiropractic

Continuous speech recognition describes computer software systems that can generate accurate documents utilizing natural speech. Software packages can be obtained at between \$150.00 and \$250.00 that can be operated on computer systems costing between \$1500 and \$2000, making capital outlay reasonable. This paper reviews the experience of utilizing a commercially available continuous speech recognition system within a radiology department in a chiropractic educational environment.

METHODS

The voice dictation system outlined in this experience was chosen on the basis of its relatively low cost and its reputation in the voice dictation industry. Concurrent issues critical in selecting voice dictation systems include speech recognition accuracy at natural speech rates and an extensive dictionary that includes health care terminology. The dictation system was operated on a 500-MHz laptop with 128 Mb RAM. The hand-held microphone included with the software was discarded in favor of a Philips Speech Mike USB microphone. Two operators were radiology residents, one with 3 years of radiology training and the other with 2 years of radiology training. The third individual was a chiropractic radiologist with 15 years of radiology reporting experience.

RESULTS

The system has proven adequate for the dictation requirements of three individuals interpreting between 30 and 50 radiographic reports each day. Initially, reporting times were protracted as compared with dictation on a conventional tape recording system. However, this difference was

inconsequential within a short period of time. The availability of a completed radiology report was improved by approximately 1/2 day. An unexpected benefit was that the radiology reports dictated by the residents were immediately available to the supervising radiologist and could be compared and correlated to the radiographs. A second unexpected benefit was that since the radiology reports are constantly viewable during the dictation the radiologist has an ability to "construct" the radiology report to their satisfaction.

DISCUSSION

This voice dictation program has most adequately met the demands of the radiology department. The program is acceptably accurate and has a dictionary that contains most words relevant to health care and radiology and has completely negated the need for a human transcriptionist. Dictation errors are manageable with corrections taking relatively minimal time. The turnaround time between radiology reporting and printing of the radiology reports has been dramatically shortened. Adding the Philips Speech Mike USB microphone has made the dictation experience more natural with less need to touch the computer. Computers must be of relatively high speed with specifications of at least 550 MHz and 128 Mb RAM. While the software documentation indicates that smaller computers can be used, the lag time in dictation is likely to be frustrating to the user.

CONCLUSION

Although voice dictation programs can be expected to improve even further in regards to speed and accuracy, this system has proven both cost-effective and practical in the chiropractic educational environment.



Development of an Ethics Policy in a Chiropractic Specialty

William J. Moreau, D.C., D.A.C.B.S.P.

As the chiropractic profession matures, many organizations and groups within the profession are creating and implementing ethics policies. Ethics complaints are a serious issue to health care providers. Any organization attempting to address an ethics violation must do so in anticipation of possibly defending their actions and policy in court. Ethics codes can vary widely. A well-developed policy must be clear in expressing what is and is not acceptable. The policy must also contain a fair appeals process. One significant consequence of codes of ethics or other standards of practice is that they may define the legal standard of care that certified individuals in a particular industry or profession are expected to meet.

The American Board of Chiropractic Sports Physicians (ACBSP) is a certifying board for sports chiropractors. The ACBSP has invested in the development of an ethics policy and the supporting procedures to this policy. The ACBSP recognizes that there may be benefits to the chiropractic profession in establishing ethics policies that are somewhat uniform and recognized by outside groups and organizations within the profession. The ACBSP has offered their policy and procedures to the chiropractic profession.

The ACBSP is a certifying board that develops policy and procedures concerning the examination and certification of qualified doctors of chiropractic to become certified as a Diplomate of the American Chiropractic Board of Sports Physicians (DACBSP), or as a Certified Chiropractic Sports Physician (CCSP). The ACBSP identified the objective of obtaining outside recognition, by the National Commission for Certifying Agencies, of the ACSBP certificants and the certification procedures the ACBSP utilizes. Individuals serving as specialists in certification related issues were employed to consult with the ACBSP. These certification specialists evaluated the ACBSP policies, procedures, and bylaws to identify areas of deficit.

The development of a comprehensive ethics policy and the supporting procedures to implement this policy was one of the areas needing development. Other ethics procedures utilized in the chiropractic profession were reviewed. Many ethics policies are substantial, but the important supporting procedures were not adequately developed to the level that would meet the National Commission for Certifying Agencies review. Specifically, some policies did not provide a clear mechanism for appeal by a doctor who has had a compliant brought against them.

The ACBSP Board of Directors created a new policy that specifically addressed compliance with laws, policies, and rules relating to the profession; professional practice obligations; requirements related to research and professional activities; conflict of interest and appearance of impropriety requirements; compensation and referral disclosure requirements; confidentiality requirements; and misconduct prohibitions. The completed policy was distributed to the American Board of Chiropractic Specialties (ABCS) during their annual Board meeting on 1998. The ACBSP offered the ABCS the ethics policy and requested the certification boards that adopt the policy to provide some financial assistance to defer the cost of developing this policy. Because of limited financial resources, the majority of the boards are unlikely to produce an ethics policy independently.

The ACBSP worked to initiate the concept of developing some uniformity, concerning ethics, within the chiropractic specialties and to provide a baseline document for the chiropractic profession. As the chiropractic profession continues to mature and develop, there will need to be further development and refinements to the documents that define the profession. These documents will define the profession to itself and to others who observe and review the documents the profession utilizes. By reiterating ethical principles that have provided guidance in resolving past ethical problems, it may help chiropractic physicians to avert future problems.



Formative Peer Review of Course Design Planning Process and Implementation

Paul Mullin, B.A., D.C., and Rita Nafziger, M.B.A., Palmer College of Chiropractic

Teaching is the backbone of any educational institution including professional colleges. The ultimate goal of “teaching” is for the student to gain usable knowledge, interpersonal, and professional skills that can be readily

applied in their practice upon completion of the program. Professional colleges all face a similar challenge in that many faculty members are exceptional clinicians but lack formal training in teaching. One inexpensive and perhaps

less anxiety-producing means of training professional college classroom teachers is to utilize peer reviewers/mentors to assist with initial course design and to improve existing designs.

OBJECTIVES

Four faculty members were assigned to the task of creating a uniform peer review for classroom teachers to be coordinated through the Center for Teaching and Learning. Goals were to identify the components of "classroom teaching" that would be reviewed; assure that the process would be congruent with and reinforce program (curriculum) goals and objectives; determine the intent of the peer review (i.e., formative or summative); determine the format of the review process and expected results; provide reviewers with tools and training to conduct the process; and assess whether or not the expected results were attained.

METHODS

The group identified three distinct and separate components of classroom teaching: course delivery, course design, and course content. In our exploration of the program (curriculum) goals and objectives, it became obvious that, for the sake of clarity, we needed to distinguish them from course (instructional) goals and objectives. In regard to the intent of the charge "develop a peer review process for classroom teaching," the task force was very much in agreement that the process should be formative (development) in nature as opposed to summative (employment) in nature. With the information from the literature search and particularly a paper by Kathleen Brinko, "Visioning Your Course: Questions to

Ask as You Design Your Course," which lists steps involved in designing a course, we constructed a course design questionnaire. A protocol for the peer review of course design was developed to be reflective, nonthreatening, and formative in nature. Due to pending curricular revisions the "peer review of course design process" has, at this point, been suspended, and no assessment of the process has been done.

RESULTS

The components of classroom teaching have been identified. The process is consistent with program goals and objectives. The intent of the process is strictly formative in nature. A questionnaire of course design has been created. A protocol and training process for peer reviewers has been developed. Implementation and assessment of the process has not occurred.

DISCUSSION

A peer review of course design process has been created as a complement to the peer review of course delivery. It could be available for new classroom teachers or those interested in a different perspective at virtually no expense. The process needs to be piloted, refined, and evaluated in regard to the impact it has on an individual course design. It also needs to be determined if the process will be voluntary, recommended, or required. Of the three components of peer review of classroom teaching, peer review of course content still needs to be crafted. Although peer review of course design has not been activated, we feel we have created a valid and viable peer-review process. We wish to share our efforts with other chiropractic educators should they be interested in a similar endeavor.



Research Attitudes Among Chiropractic College Students and Alumni Perspective in 2001

Dennis Nosco, Ph.D., Logan College of Chiropractic

Student attitudes about the place of student research and research courses in the curriculum have been studied in many health care fields. This includes chiropractic, where four previous studies have been done, each aimed at different aspects of students' attitudes toward research. The goal of the current study was to measure how students' attitudes toward research change as they move toward chiropractic degrees and compare these attitudes to those of alumni.

METHODS

A 30-question survey was designed to be applicable to students and alumni. Questionnaires were administered to students during classes and to alumni at the 2001 homecoming event. Data were analyzed descriptively for frequency, mean, and standard deviation, and for trends (ANOVA/regression).

RESULTS

Alumni (88, less than 5% response rate) and students (449, 59% response) participated in this study (75% male). Fifty-one percent of students had interest in conducting research, 40% had previous research experience, 64% had thought of research topics, and 62% would do research if they had training (75% of fifth-semester students). The correlation between students who thought of a research topic and those who would do research with proper training was $R^2 = .987$. Forty-two percent of students said that chiropractic research should be conducted by a combination of: chiropractic college research departments, field doctors, and NIH-like organizations. Interest in research in general, in learning to write up case studies, in continuing education courses in research, and in having participation in research and research courses be graduation requirements all decreased as students moved closer to graduation, sometimes below alumni levels.

DISCUSSION

The viability of student research at chiropractic colleges has previously been questioned in the literature. The present study hypothesizes that it may be the nature of the research exposure and the location of that exposure in the curriculum that influences students' opinions about the importance of research and their desire to participate in it in chiropractic

school and when they become field doctors. Specifically talking about student research projects, students may not have positive attitudes about research after completing a project because they did not see how it benefited chiropractic and they did not continue in research long enough to make their initial time investment worthwhile. The current study found that interest in research lessened as students got closer to matriculation with a peak in interest around semesters 4–5. The questionnaire results show that students are naturally curious, are thinking about research even as they are in the early semesters at chiropractic college, and would be more interested in doing research if they had proper training, even though many of them have no previous research experience. These results indicate that the seeds are planted to help students become researchers. Possible methods to cause those seeds to bear fruit are: 1) extend the exposure of students to research by giving them small parts in research projects over a number of semesters; 2) focus their interest in research to case studies or case series (a publication type that is easier to understand and execute than a clinical study and is readily adaptable to use in their practice after graduation); and 3) place research methods courses earlier in the curriculum, where possible.

CONCLUSIONS

Students are interested in research, especially early in the curriculum.



Reliability Study of the Penning Method for Cervical Intersegmental Motion Assessment

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This study was conducted to evaluate the inter- and intraexaminer reliability of the Penning method in marking lateral cervical spine flexion/extension radiographs. Two common methods (Buetti-Bauml and Penning) for analyzing cervical flexion/extension radiographs are found in the literature. The few studies that have assessed the reliability of these methods conflict as to which is most reliable, and film quality seems to be a determining factor. The Penning method appears to be easier and quicker, but the Buetti-Bauml method is claimed to be more reliable with poor quality films.

METHODS

Forty cervical flexion/extension radiographs (duplicate sets of the same 20 films) were marked twice with the Penning

method by three experienced radiologists who were masked to film status. The range of motion at each level was recorded for each pair of radiographs. The data were analyzed by intraclass correlation coefficient to evaluate inter- and intraexaminer reliability.

RESULTS

The intraclass correlation coefficient ranged from .51 to .88 for radiologist 1, .66 to .97 for radiologist 2, and .89 to .98 for radiologist 3. An intraclass correlation coefficient greater than .75 is considered good reliability. Interexaminer reliability was greater than .75 at all cervical levels. Intraexaminer reliability was above 0.75 at all six levels for radiologist 3; five out of six levels for radiologist 2; and four out of six levels for radiologist 1.

DISCUSSION

This study shows the reliability of the Penning method despite the many variables that make each radiographic study unique. The films were taken on different equipment, with varying technical factors, by multiple technologists, on patients with their own distinctive anatomical variations. The participating radiologists commented on the increased radiodensity of some film sets; yet the intraclass correlation coefficient demonstrated high intra- and interexaminer reliability. This study suggests that the Penning method is adequate for a variety of cervical flexion/extension

radiographs, allowing for general use in assessing intersegmental motion.

CONCLUSION

The Penning method of cervical flexion/extension intersegmental motion analysis demonstrates good inter- and intraexaminer reliability with experienced radiologists. Further studies are suggested to compare the Penning and the Buetti-Bauml method to determine which is most reliable with varying film quality.



Short-Term Stability and Reliability of Paraspinal Infrared Thermal Scans

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Paraspinal temperature profiles have long been used in chiropractic as one indicator of the presence of vertebral subluxation. The complexity and volume of the information contained in a thermogram have made the reliability of paraspinal thermography difficult to ascertain. Hence, while the tool is in common use, its clinical utility is not well tested. The advent of hand-held digital infrared scanners has enabled more sophisticated and objective analysis of paraspinal thermal skin patterns. We developed specialized analysis software that computes congruence factors between any two thermograms as a way to judge their similarity. This software is being used in short-term and longer-term studies to assess the changes that occur over time.

METHODS

In this short-term reliability study, two different doctors performed full-spine scans on 30 student subjects four times in rapid succession using the TyTron C3000 dual-probe infrared scanning system (Titronics Research and Development, Oxford, OH). The digital thermograms are saved and imported into our custom analysis software. The software is interactive in that it allows the operator to improve the overlap of thermograms by shifting them vertically with respect to each other, and clipping off artifacts at the ends of the scans.

RESULTS

With four scans for each patient, there are six unique comparisons of pairs of thermograms. With 30 patients, 180 comparisons were produced. The pattern analysis software calculates a set of 15 congruence factors for each of the

six comparisons. The congruence factors were analyzed in Excel spreadsheets using descriptive statistics as well as the calculation of distributions of congruence factors. All the congruence factors produce values that range from 0 to 1, where 1 is perfect congruence. The goal of the analysis was to determine: if there were differences in the scans produced by the two different scanning doctors; if there were differences depending on the congruence calculation software operator; and which congruence factors produce the greatest sensitivity and specificity in discriminating subject's thermal scans from each other.

Three sets of distribution charts were generated to enable a visual inspection of the differences in congruence factor distributions: between scanning doctors versus among scanning doctor, analysis doctor versus analysis doctor, and congruence factors of patients compared to themselves versus when patients are compared to other patients. We examined the distribution charts, looking for the width of distribution and the overlap of the pairs of curves. Several of the congruence factors produced narrowly distributed congruence factors. It was seen that intraexaminer reliability for the scanning procedure is greater than interexaminer and that software operators can produce slightly different results. Clipping of artifacts at the beginning and end of temperature profile produces higher congruence factors. Also, not all algorithms perform equally. In terms of the ability to discriminate "self" from "not self" scans, the *R*-ratio has both sensitivity and specificity greater than 90% for all three channels of data.

DISCUSSION

In calculating sensitivity and specificity, the assumption was made that thermal scans of the same subject

taken in rapid succession will be very similar, providing an upper bound on congruence factors. Also, comparing thermal scans between patients will provide a lower bound for congruence factors. Hence, the congruence factors that maximize the sensitivity and specificity should provide the best tools for testing when a patient's thermogram is significantly similar at two different times.

CONCLUSION

A software tool has been developed to test the similarity of paraspinal temperature profiles. Two of the congruence factors produce very high sensitivity and specificity for determining when a thermogram is similar or not, based on a comparison of congruence factor distributions calculated between versus among patients.



A Model Course for Public Health Education in Chiropractic Colleges Final Report

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Public health education in chiropractic colleges was examined by The Model Syllabus Task Force of the Chiropractic Health Care Section of the American Public Health Association. A template syllabus was offered. To continue this work, a multidisciplinary team representing eight chiropractic colleges, private practitioners, the Model Syllabus Task Force, The School of Public Health at Yale, The Association of Chiropractic Colleges, and The National Board of Chiropractic Examiners was formed.

METHODS

Overall course goals were designed. Subject specific teams then developed measurable learning objectives in Epidemiology and Biostatistics, Health Services Administration, Environmental Health Sciences, and Behavior Health Sciences to support these goals. Concurrently, there was survey assessment of student, faculty, and practitioner attitudes on public health. A Public Health Workshop was conducted at the March 2001 ACC meeting. Course goals,

subject-specific learning objectives in each area, and sources of public health information have been compiled into a course workbook and disseminated to all U.S. chiropractic colleges and other interested parties.

RESULTS

This presentation reports on the content and design of the model course, including overall course goals, subject-specific learning objectives, the proceedings of the public health workshop, and the course workbook.

ACKNOWLEDGMENT

This project (ASPH Project # H092-04/04) is supported under a cooperative agreement from the Health Resources and Services Administration through the Association of Schools of Public Health.



The Effect of Manipulation of the Tibiotalar Joint in Asymptomatic Students on Ankle Motion During Walking and on Ankle Isokinetic Strength

Stephen M. Perle, D.C., C.C.S.P., Bridgeport University College of Chiropractic

Chiropractors and their patients have claimed that manipulation improves athletic performance and accelerates the rate of recovery from athletic injury. There have been a limited number of studies that have investigated chiropractic's effects on human performance measures. Only two clinical trials of manipulation of the foot/ankle have been performed. The purpose of this study is to investigate the effects of manipulation of the tibiotalar joint on muscle strength and joint motion during walking.

METHODS

Forty subjects were recruited. Ten subjects were randomly selected for a test-retest reliability study. Fifteen subjects were randomly assigned to control and to treatment groups. An isokinetic dynamometer (MERCK) was used to assess muscle function at 60 deg/s for dorsiflexion and plantarflexion. Three repetitions were performed. Subjects had spherical reflective markers applied to the landmarks on the right leg and foot and to the left ankle.

The subjects walked on a treadmill at a self-selected speed. Three 60-Hz digital infrared cameras were used to collect motion data for 5 seconds. For the test-retest reliability 10 minutes after the first test, the procedures were repeated.

Treatment consisted of anterior to posterior manipulation of the tibiotalar joint on a portable drop piece. For the sham manipulation an Activator™ adjusting instrument set to deliver 0 N of force was used. After manipulation or sham, the post-treatment data were collected.

For motion analysis, a three-link segmental model of the body with lumped feet and lower leg was used. Third derivative of joint angle versus time (jerk) for motion in the sagittal plane was used for analysis of the smoothness of movement.

RESULTS

There were no statistically significant differences between groups with regards to age or gender. Differences

were found between the groups with respect to previous chiropractic care and previous ankle manipulation but not regarding current foot/ankle disorder. Test-retest correlations showed significant correlation among most of the dependent variables. There were no statistically significant differences between groups for any variables assessed.

DISCUSSION

There may have been no significant result because the subjects were not selected based upon the presence of any joint dysfunction. While ankle manipulation may be helpful in the treatment of ankle sprains, the ubiquitous application of ankle manipulation as an ergogenic aid does not appear reasonable.

Based on the test-retest study, the muscle isokinetic outcomes used in this study appear to be reliable. However, of the motion outcomes, only maximum dorsiflexion and plantarflexion are somewhat reliable, and it is therefore reasonable that no statistically significant changes were noted in the motion outcomes.

CONCLUSION

Anterior to posterior tibiotalar manipulation does not appear to have a positive effect on ankle range of motion, smoothness of ankle movement, or any isokinetic measure of plantarflexion or dorsiflexion muscle function in subjects who have not been diagnosed with joint dysfunction. Given the results of this study, future investigations should concentrate on improving the reliability of the motion assessment and should have a diagnosis of the appropriate joint dysfunction as an inclusion criterion.



Radiographically Determined Anatomical Location of Point of Peak Pressure During Pisiform and Hypothenar Contact Manipulation Procedures

A Pilot Study

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Manipulation is defined as a manual procedure that involves a directed thrust to move a joint past the physiological range of motion, without exceeding the anatomical limit. Most commonly, manipulative forces are applied by the palmar surface of the practitioner's hand. Because the skeletal landmarks of the hand are nonuniform in shape and in distance from the palm, hand orientation may modify the applied force magnitude and/or point of force application—variables that may potentially influence treatment specificity and/or patient safety. Unfortunately, we were unable to identify any previous work investigating this area. Therefore, the purpose of this study was to determine the anatomical location of the area of peak pressure during manipulative thrusts with different manipulative contacts.

METHODS

A two-dimensional array of pressure sensors was calibrated and used to determine the peak pressure exerted by a single doctor's hand during manipulation. A single sensor within the array was identified as the "target" and three different cueing systems were used to locate the target: 1) a visual system (9.5-mm diameter circle printed on polyester film); 2) a visual/phalangeal system (doctor's index finger—removed prior to thrust); and 3) a visual/tactile system (a 1.75-mm thickness \times 9.5 mm diameter plastic disk). With the sensor array placed on a rigid surface, the practitioner provided 12 manipulative thrusts with various combinations of cueing systems and hand contact shapes: a high arched hand and a flat hand hypothenar contact. The location of the peak pressure within the sensor array was then identified. In the final two trials, dorsal-palmar radiographs of the practitioner's hand position in relation to the sensor array were obtained.

RESULTS

Manipulations performed with an arched hand and visual target cueing registered peak pressures in nontarget locations

(trials 1–3). In contrast, an arched hand with visual/phalangeal cueing resulted in on-target peak pressures (trials 4 and 5). Similarly, an arched hand and visual/tactile cueing produced on-target peak pressures (trials 6 and 7). Following trial 7, the contact shape of the hand was changed from arched to flat without a change in gross hand position. Manipulative thrust using this orientation resulted in off-target peak pressures (trials 8 and 9). However, when these same trials were repeated with visual/tactile cueing to position the presumed hook of the hamate over the target, peak pressures became on-target (trial 10). Radiographs demonstrated that the pisiform and hamate were located immediately over the target sensor for the arched and flat-handed contacts, respectively (trials 11 and 12).

DISCUSSION

In this study, we demonstrated that visual cues alone do not appear to be sufficient for localizing peak forces. Specifically, placement of the hand on a visually identified target does not appear to be an accurate method of localizing force to a manipulative target. Alternatively, cueing systems that use some form of tactile feedback increase manipulative force localization accuracy. This study also demonstrated that alterations in the hand configuration changed peak force locations within the hand. Specifically, peak pressure delivered with a flat-hand contact corresponded to the location of the hook of the hamate, while an arched contact transmitted force through the pisiform.

CONCLUSION

The results of this study indicate that the application of a manipulative force to a specific point can be made more accurate by a visual/phalangeal or visual/tactile cueing system and that different hand shapes transmit force through different skeletal structures of the hand. Given the results of this pilot study, further investigation will be performed to determine the impact of these two factors on treatment specificity and patient safety.



Structured Self-Assessment Radiology Cases

A Tool to Reduce Faculty Contact Time, Increase Student Problem-Solving Ability, and Facilitate Learning in Larger Laboratory Groups

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Student learning in clinical subjects is facilitated by teaching and assessing using methods that simulate the realities of clinical practice. This problem-based approach is best accomplished with small-group teaching in laboratories or seminars and practical assessments applying the knowledge and skills necessary to practice safely and competently. However, such teaching and assessing methods are often very labor intensive and require more faculty contact time than institutions can afford to offer. Structured self-assessment exercises were created in radiology to provide clinically real cases for students to work through on their own time, thus alleviating some faculty contact time while still allowing small-group view box sessions. Radiology examination formats mirrored these self-assessments, but with different radiographs, thus examining student competency in a real-life situation. These changes were in sharp contrast to the teaching and assessing formats previously experienced by the students. Therefore, student feedback on the effect these changes had on their learning and study approaches was imperative.

METHODS

At the end of the 2000–2001 academic year, a questionnaire was distributed to 107 first-year students to solicit their opinions on the usefulness of the self-assessment exercises, how this approach compared to the previous method of conducting radiology labs (using a 5-point Likert scale where 0 = not at all useful and 5 = very useful), and how these exercises influenced the way they studied and learned radiology, if at all. This was done by asking the students to rank their various study approaches according to the amount of time spent at each activity before and after the teaching and assessment changes. The students' opinions of the substitution of multiple-choice film reading and written examinations with strictly film reading examinations, which required short answers in a problem-solving format, were also solicited.

Descriptive statistics were evaluated and qualitative feedback was requested and obtained.

RESULTS

Canadian students rated the usefulness of the self-assessment exercises very high (4.7 out of 5). This was minimally below their opinion on the usefulness of the 20-person view box tutorials with the instructor (4.9 out of 5). They were also strongly in favor of the elimination of multiple-choice and written examinations in favor of film reading, short-answer examinations (4.6 out of 5).

One hundred percent of the students reported that their approach to studying radiology had changed dramatically as a result of these changes. They spent more time in the lab looking at the radiology teaching films rather than using note-service and textbooks. Written comments on the qualitative part of the questionnaire were consistent in stating that their study time was more useful, relevant, and fun since the teaching and assessment changes were made. They felt that they understood and remembered far more with the new approaches as compared to memorizing small details for future regurgitation on the former multiple-choice question examinations.

DISCUSSION/CONCLUSION

Self-assessment exercises facilitate student problem-solving ability and integration, are popular with the students, can reduce faculty contact time, provide additional learning tools for larger laboratory group sizes, and better prepare the students for the realities of clinical practice. They are time consuming to prepare initially, but once created, can be reused in subsequent years. Changing the format of radiology examinations has a significant impact on the approach to learning and the depth of learning adopted by the students. Similar exercises can be created for other clinical subjects.



Kinematic Analysis of Chiropractic Spinal Manipulation A Comparison Between Experienced and In-Training Providers

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This study investigated kinematic parameters of chiropractors performing spinal manipulation. The purpose to this study was to compare kinematic parameters of in-training chiropractic interns and experienced chiropractors delivering a thoracic spinal manipulation procedure. A second purpose to the study was to collect subjective data from the volunteers receiving chiropractic adjustments regarding perceived comfort and success of the procedure. Prior research has focused on the kinetics of chiropractic procedures but no prior research has focused on kinematic parameters. Kinematic parameters evaluated included peak wrist linear velocity, wrist vertical displacement, head vertical displacement, dominant elbow peak angular velocity, and nondominant elbow angular velocity.

METHODS

Twelve newly trained novice chiropractic intern volunteers and 12 experienced chiropractic physician volunteers who routinely use the diversified system of spinal manipulation therapy were selected to participate in the study. Patient volunteers consisted of a group of 48 male chiropractic students selected for similarity in stature, weight, and age.

Each provider was filmed with a high-speed video camera while delivering a thoracic manipulation to two different student volunteers. Peak 5 2D Video Motion Measurement Software was used for analysis of data. Data obtained from the two trials for each provider were averaged and each

parameter was compared using an independent *t*-test with a level of significance of $p < .05$.

RESULTS

There were no statistically significant differences between in-training and experienced providers among any kinematic parameters evaluated, including peak wrist linear velocity, wrist vertical displacement, head vertical displacement, dominant elbow peak angular velocity, and nondominant elbow angular velocity. In contrast to these findings, there were statistically significant differences between the two groups of providers in subjective ratings of the blinded volunteers receiving the treatment. Subjective evaluation included perceived comfort of the procedure and perceived success of the procedure.

CONCLUSION

This study confirmed that differences exist in the perceived comfort and success in volunteers receiving manipulation from novice and experienced chiropractors. Unfortunately, it is concluded that this difference is not accounted for in the kinematic parameters evaluated. These results point out the need for additional study to quantify measurable differences in the way chiropractic manipulation procedures are performed by a variety of providers.



Inflammation of Lumbar Multifidus Muscle Reflexively Increases Sympathetic Nerve Activity to Spleen and Kidney

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Little is known about the effects of deep-tissue inflammation or pain on the activity of sympathetic nerves innervating visceral organs. Manipulative therapies, such as chiropractic and osteopathy, hold the view that dysfunction of the vertebral column and paraspinal tissues may affect visceral organs via reflex effects initiated by mechanical or chemical changes

in the paraspinal tissues. The purpose of the present study was to determine if sensory input during inflammation of paraspinal tissues alters the activity of the sympathetic nerves to the spleen and kidney and thus could contribute to changes in the function of an internal organ. The spleen was chosen because of its contribution to immune function as a secondary

lymphoid tissue. The kidney was chosen because of its role in cardiovascular regulation and fluid balance.

METHODS

In 20 anesthetized cats, splenic and renal postganglionic sympathetic nerve discharges (SND) were recorded. The L2–4 multifidus muscles were unilaterally injected with the inflammatory irritant mustard oil (20%, 2 injections/muscle, 60 µl total).

RESULTS

Mustard oil injection immediately increased blood pressure by 50 mmHg and produced a prolonged increase in splenic and renal SND (45–100%) to both organs. In three cats, mineral oil (vehicle) injection did not affect blood pressure or SND to spleen and kidney. In four cats, each nerve innervating the multifidus muscle from T11 to L5 was cut on the same side as mustard oil injection. With the medial branch of the dorsal rami cut, mustard oil injection did not evoke similar increases in blood pressure and SND in these cats. In six cats, the spinal cord was transected at C2–3 level. With spinal cord transected, mustard oil injection did

not evoke similar increases in blood pressure and SND in these cats.

DISCUSSION

The results indicate that an inflammatory irritation of the lumbar multifidus muscle can evoke a somatovisceral reflex. The neural reflex's afferent arm travels from the medial-most paraspinal tissues via the medial branch and up to brain because spinal cord transection at C2–3 level abolished the reflex. The reflex's efferent arm can affect blood pressure and sympathetic outflow to the spleen and the kidney.

CONCLUSION

Inflammation of lumbar paraspinal tissues, as during low back pain, may have reflex consequences for the autonomic nervous system not previously recognized.

ACKNOWLEDGMENT

This study was supported by NIH Center Grant U01-AT00170 from NCCAM.



Effects of the California AIDS Ride on Student and Intern Attitudes

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For 7 out of the 8 years that the California AIDS Ride has occurred, the Southern California University has sponsored the "Chiropractic Crew." The crew consists of chiropractic interns, students, and faculty. The interns who are supervised by the faculty deliver the bulk of care. An average of 1,400 patient visits are seen at each year's event. Many conditions are seen during the 7-day ride. It is believed that the high number of patient visits with a wide variety of conditions in such a short period of time has a positive effect on the interns and students who participate on the event. The purpose of this study was to assess the value of putting a team of interns and students together to provide chiropractic care to the crew and participants of a large-scale sports event. The following hypotheses were considered:

1. Students who chose to compete in the rigorous process for selection will be committed to chiropractic and perceive themselves as having good skill levels.

2. Six intense days of treating patients will further improve the students' attitudes about their profession, college, faculty, and adjusting skills.

METHODS

A survey was created within three domains: 1) attitude toward the chiropractic profession, 2) attitude toward the education received at SCU, and 3) self-perception of technique ability. Data were entered and verified using a SPSS Software package. As this project was a pilot to determine whether it was possible to get compliance for such a research effort as well as to determine whether there would be sufficient variance among persons who are believed to be positive about chiropractic in general and in their own skills, only descriptive statistics are currently reported.

RESULTS

The survey conducted before the event occurred showed that the students and interns started out with a rather positive attitude towards their profession, education, and adjusting skills. This finding supports hypothesis 1. The results of the attitude survey conducted after the event continued to demonstrate the positive attitude of the students and interns. However, the level of agreement to 54% of the statements was higher than before the event. The overview of the survey results show that the experience of the California AIDS Ride is beneficial to the chiropractic students and interns.

DISCUSSION

It is interesting to note the high level of positive agreement with the statements of the pre-event survey. This would

suggest that the students able to pass the rigorous task of applying to participate on the ride tend to be highly motivated individuals. Starting out with such a high level of agreement confirms hypothesis 1 but thus hypothesis 2 was more difficult to vigorously confirm as there was less variance possible.

CONCLUSION

The results of this preliminary study indicate that there is an improvement of student and intern attitudes after participating with a chiropractic crew delivering care to hundreds of riders and their supporters. Further study is needed to measure the full benefit of having students and interns participate in a chiropractic crew for an event like the California AIDS Ride.



A Pilot Test on Peer Review of Teaching

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Previously we had reported on the development of a procedure for the peer review of teaching and the intention of conducting a pilot test on the instrument. Establishment of validity of the instrument is critical prior to incorporation into the existing overall faculty performance appraisal (FPA). The pilot test was conducted during two semesters in 2000, and the results are presented in this report.

METHODS

The development of the procedure and forms to be used and the literature base have been reported previously. The FPA Subcommittee established a pool of peer reviewers who were full-time faculty members. At the beginning of the semester, each faculty member was required to select two reviewers from the pool for each course he/she would be teaching. The two reviewers received an evaluation form with instructions and a form for recording. In addition to scoring, the reviewers were encouraged to write comments on the back of the form. Upon completion of the review, the reviewers returned the results to the faculty member's immediate supervisor for analysis. Only preclinical faculty members were evaluated in this pilot test.

RESULTS

The reviewers initially recorded the evaluation scores for each faculty member. The number of preclinical faculty

members evaluated was 16 out of 28 (57.1%). Out of 63 preclinical courses, 32 (50.8%) were evaluated. Twelve items were evaluated for each course using a 5-point scale for computation: "strongly agree" = 4, "agree" = 3, "disagree" = 2, "strongly disagree" = 1, and "indeterminable" = 0. For item 7, every reviewer answered this item "strongly agree." Six of the items (1, 2, 5, 6, 8, and 10) had mean scores between 3.50 and 4.00 and a SD of about 1.00; therefore, most of the reviewers answered these items "strongly agree" also. Five of the items (3, 4, 9, 11, and 12) had means of less than 3.50 and SD greater than 1.00, indicating that reviewers chose answers other than "strongly agree."

DISCUSSION

The results of survey item 7 ("The instructor demonstrated command of the subject matter") show the homogeneity of the central tendencies across the board. This demonstrates that the faculty members are matured professionals who are quite knowledgeable in their subject area. Items 3 ("Case studies and/or laboratory activities, if any, were closely integrated with lecture"), 4 ("Instruments employed to evaluate students' learning outcome were appropriate"), and 12 ("Literature sources for instruction were provided") were questions that might have required more information regarding the teaching activities.

Items 9 (“The instructor challenged students with appropriate questions for the learning process”) and 11 (“The instructor answered students’ questions satisfactorily”) both deal with questions being asked during the teaching experience either by the instructor or in response to students. This may be indicative of the teaching style of the instructor or that the instructor is not good at answering questions. In this case, this is a developmental issue for the instructor.

The balance of the 12 items were also analyzed. These were determined not to be developmental issues but processing issues for the faculty.

CONCLUSION

This pilot test has confirmed that the instrument developed for the peer review of teaching is workable.



Contents for Chiropractors’ Athletic Event Emergency Bags A Systematic Review

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Chiropractors are providing health care at a growing number of athletic events. With this increased participation, it is critical that chiropractors be adequately prepared for these events with the proper knowledge, skill, and equipment to provide emergency care. The objective of this work is to recommend an inventory of items that should be included in a chiropractor’s event site emergency bag, based upon the best available evidence.

METHODS

A pilot search was conducted by searching MEDLINE to retrieve articles regarding emergency supplies used at athletic events. Key terms were then taken from the pilot search and used to conduct a systematic search and review of the literature. Articles were included if they were published in English and discussed athletic event-site emergency first aid and supplies. Papers published in non-peer-reviewed publications were excluded. Items recommended for event site emergency care bags were extracted from 19 studies and reviewed by an expert panel of sports chiropractors.

Expert rankings from a Likert scale were then averaged for each item. Items were categorized as recommended, possibly recommended, or not recommended based upon expert rankings and frequency counts of citations.

RESULTS

The most recommended items are latex gloves, penlights, and oral airways. An inventory of 169 items with citations and ratings is included in this review.

CONCLUSION

This is the first evidence-based paper to delineate appropriate first aid and emergency equipment for sports chiropractors. This paper has utility for educators who teach emergency care for athletic events and for practitioners who would like to have a clear inventory for their emergency bags.



The Use of Diagnostic Ultrasound Imaging in the Verification of Trigger Point Diagnosis

A Blinded Study

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Myofascial pain syndrome is characterized by the presence of trigger points, which are tender nodules within taut bands of hyperirritable skeletal muscle. Despite the clinical prevalence of myofascial pain syndrome, trigger point diagnosis is reportedly highly subjective and dependent on the skills of the palpating clinician. Difficulties related to the establishment of clearly defined clinical criteria and to ambiguous terminology have rendered the unequivocal diagnosis of myofascial pain syndrome extremely difficult. The advent of an objective procedure by which to identify trigger points would clearly enhance the validity of the myofascial pain syndrome diagnosis. There has been a recent surge of interest in the medical application of diagnostic ultrasound, a relatively noninvasive and inexpensive method which is potentially useful for diagnosis of neuromusculoskeletal disorders. The purpose of this study was to investigate the potential role of ultrasound imaging as a means to confirm the diagnosis of myofascial trigger points.

METHODS

The protocol described in this study was approved by the New York Chiropractic College Institutional Review Board. Volunteer subjects ($n = 12$; 20–50 years in age), prescreened at the Campus Health Center, were determined to present with latent trapezius trigger points. A chiropractic clinician trained in trigger point diagnosis and a chiropractic clinician trained in diagnostic ultrasound interpretation participated in the study. Each was blinded as to the findings of the other. The palpating clinician examined the middle trapezius muscle bilaterally, using diagnostic criteria as described previously in conjunction with subject feedback, so as to identify the most clinically apparent trigger point. The location of the trigger point was indicated using nontoxic marker to circle the area (diameter 0.5–1.0 cm).

A clinician trained in the use of the diagnostic ultrasound recorded images from the trapezius muscle of volunteer subjects who were seated behind a curtain. The ultrasound technician was instructed by an assistant as to which trapezius muscle (left vs. right) had been identified by the palpating

clinician as having a trigger point. Using the vertebral prominens as a landmark, the ultrasound probe was moved medial-to-lateral along the entire length of the trapezius muscle while viewing the ultrasound image on a monitor. The images identified by the ultrasound clinician all consisted of discrete dark hyperechoic areas surrounded by light hyperechoic bands. When the technician had identified an area that visually appeared as a trigger point, the assistant then placed a mark directly under the center of the ultrasound probe. The assistant subsequently measured and recorded the distance between the center of the two marks that had been designated as trigger points by the palpating clinician and ultrasound technician, respectively.

RESULTS

Analysis of the results of this preliminary study found no correlation between the clinical identification of trigger points and diagnostic ultrasound identification. The mean difference between the two markings was 3.1 cm, and the range of distances was 0.75–5.5 cm.

DISCUSSION

Previous studies have indicated that diagnostic ultrasound appears to be a viable adjunct to the evaluation of various musculoskeletal conditions. The results of the current study suggest that diagnostic ultrasound imaging may not be a reliable means to identify trigger points. Our results are in agreement with Lewis and Tehan, who have reported that there is no correlation between the clinical identification of trigger points and identification using diagnostic ultrasound. It is conceivable that both the ultrasound technician and the palpating clinician participating in our study were identifying two separate and distinct trigger points. Additional studies will be carried out wherein a minimum of two palpating clinicians will participate and be required to identify any and all trigger points prior to imaging the muscle.



Technical Standards for Admission and Retention Case Studies in Application

Judy M. Silvestrone, M.S., D.C., New York Chiropractic College

Issues surrounding the legal basis and methodology for construction of technical standards for admission were presented at ACC in March of 1999. This presentation looks at the institutional process for identifying, assessing, and determining a course of action for students who do not meet these standards. This presentation recapitulates the legal parameters for technical standards, a set of sample standards, the composition of the institutional review committee, and the process by which technical

standards have been applied in one chiropractic program. Evidence of outcomes of the process will be offered through review of four case studies:

1. Manual skills and motivation in an enrolled student.
2. Chronic fatigue immunodeficiency syndrome and a request for reduced course load in an enrolled student.
3. Seizure disorder in an enrolled student.
4. Severe low back injury in an incoming student.



Fitts' Law and the Effect of Chiropractic Adjustments on Movement Time

Dean L. Smith, D.C., M.Sc.

Much of chiropractic research has been devoted to determining the effects of chiropractic care on various symptoms and/or disorders such as low back pain and headaches. Little empirical evidence exists as to the effects of the chiropractic adjustment on motor control, specifically in the areas of cognition, and kinematics (including coordination, movement time). Instead, there is an abundance of anecdotal "research" ("We adjust patients and they feel better"). It is felt that research investigations into the performance effects of chiropractic care have been vastly underutilized and are long overdue. This experiment was designed to evaluate the usefulness of applying Fitts' Law to the measurement of human movement time following chiropractic adjustments and to determine what if any effects result. Fitts' Law is a highly successful psychomotor relation that accurately models human movement time. This approach was initially modeled by an experimental psychologist but has been widely adopted by numerous other research fields, including kinematics, human factors, and human-computer interaction.

METHODS

Four subjects from the author's private practice who volunteered to participate were included in this experiment. Two subjects were used as controls and two subjects received chiropractic adjustments. Each participant performed a Fitts' Law task using a mouse to move a cursor onto a circular target. The target diameter and movement distances were

systematically adjusted to achieve five different indices of difficulty (128 trials per block). Since the effect of learning this task was of consideration, all subjects performed the task until learning was deemed no longer present. At this point, the subject either: rested for a few minutes and was then given another block of trials to complete (control); or was adjusted, and then given another block of trials.

RESULTS

The two controls achieved stable (absence of learning effect) movement times after three blocks of trials. No significant differences in movement times or errors were obtained between the onset of movement time stability and the final block of trials for both controls. One of the experimental subjects also achieved stable movement times after three blocks of trials but the movement time following the adjustments was significantly decreased by 196 ms. The second experimental subject achieved stability after the first block of trials. A significantly reduced movement time was also obtained with this subject on the order of 116 ms following chiropractic adjustments. No differences in errors were observed in the experimental subjects following care.

DISCUSSION

Recent chiropractic research has found changes in brain function, kinematic differences in spinal motion, and

improved reaction times using a mental rotation paradigm following chiropractic care. It appears that there is interest by some researchers in the field to investigate the various influences of chiropractic on human behavior and motor control. This study, albeit of small sample size, adds to the growing literature on the performance-based aspects of care. Since leaders of the chiropractic profession have established that the purpose of chiropractic is to promote health (ACC Position Paper #1), it is time that more research be devoted to aspects other than condition-based and symptom-based care. There is a fundamental need to provide evidence on the performance basis of the chiropractic adjustment.

CONCLUSION

A Fitts' Law experiment of the effects of chiropractic care on human movement behavior revealed significantly improved performance times for the two subjects who received adjustments compared to controls. It is concluded that the Fitts' Law paradigm may provide a method to ascertain motor improvements following chiropractic care. Further research is planned with a larger sample to determine whether improvement in movement time is a consistent finding.



Report on an Innovative Strategy for Teaching Evidence-Based Skills to D.C. Students

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Increasing emphasis on evidence-based health care and provider accountability requires that chiropractors possess the necessary knowledge and skills to function effectively as clinical practitioners in a highly competitive and complex health care system. Chiropractors must be able to access, appraise, and apply the body of current scientific evidence to chiropractic practice. This paper reports on the design, implementation, and evaluation of one innovative curricular strategy for creating competent, evidence-based chiropractic professionals.

METHODS

The authors designed a course employing didactic, experiential, and Socratic methods to teach literature retrieval, critical appraisal, and critical thinking skills to students at a U.S. chiropractic college. Following pilot testing of new course components within an existing course, the new course was implemented for six terms. In addition to the routine student evaluations of course and faculty, a survey was periodically administered to student cohorts. The survey gathered pre- and postcourse data on the students' attitudes about the purpose and relevance of research to clinical practice; and their perceived abilities to search for, retrieve, and critically evaluate the scientific clinical literature; and also tested their knowledge and skills to effectively search and critically appraise the literature. Postcourse surveys were administered at a one-semester lag after course completion, to assess the sustainability of any improvements outside of the

controlled classroom environment. All data were analyzed and are reported as descriptive statistics with no inferential statistical analyses conducted.

RESULTS

Descriptive results indicate that most course and instructor evaluation measures demonstrated a general upward trend over the six terms of course implementation, with the remaining evaluation measures showing no noticeable trend over that same time. The time trend of student evaluations increasingly reflected their confidence in having learned critical appraisal skills and being empowered to take an evidence-based approach to practice as a result of the course. General descriptive comparisons of pre- and postsurvey data indicate some positive changes in students' perceived abilities to search for, retrieve, and critically evaluate the literature. Students' knowledge of effective search and retrieval skills (e.g., familiarity with content of search databases and correctly identifying peer-reviewed journals) also appeared to improve following the course. Student performance on the critical appraisal skill set did not noticeably change from pre- to postcourse.

DISCUSSION

A valuable lesson from this experience was that the "success" of a course such as the one described here cannot

and should not be measured on the basis of single course evaluations. The trends of evaluation results over successive course administrations may yield a more accurate picture, particularly when considering implementation of innovative curricular changes. As measured by testing of their critical appraisal skills during the course, the vast majority of students demonstrated an ability to understand and apply basic scientific concepts (e.g., study design, sampling, statistical significance, and generalizability of results) to specific studies drawn as examples from the clinical literature. However, the skills gained within this single early (second trimester) course exposure did not appear to translate well or

to be sustained outside of the controlled environment of the classroom, as indicated by the apparent lack of change in pre-versus postsurvey questions on this skill set. Equally important are the findings from this study indicating a noticeable and positive sustained change in students' attitudes towards, and perceived abilities of, their evidence-based skills pre-versus postcourse. These findings underscore the importance and utility of inspiring a confident, "evidence-based mindset" early in the student's curricular experience, as well as the need to reinforce and emphasize the development of critical appraisal skills throughout the continuum of the chiropractic student's education and clinical training.



Decompression and Co-administration of B Vitamins Alleviated Cutaneous Hyperalgesia Produced by Chronic Compression of the Dorsal Root Ganglia

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Neuropathic pain associated with conditions like low back pain and sciatica continue to pose a major clinical challenge. These pain syndromes develop in a variety of ways including injury to peripheral nerves, dorsal root ganglion, or spinal cord. Several chiropractic theories used to explain both subluxation and treatment effects of the manipulation involve a nerve compression model. To date, this model has been poorly elucidated. Recently, an animal model of chronic compression of dorsal root ganglion has been developed. This preparation provides a model of dorsal root ganglion compression in humans as a consequence of an acutely herniated lumbar disc, foraminal stenosis, tumors, or other injuries or diseases of the spine. In addition, B vitamins, such as thiamine, have been clinically used in treating some disorders in nervous systems. However, their antinociceptive activity still remains unclear.

The purposes of this study are to provide further evidence for characterizing chronic pain produced by the chronic compression of dorsal root ganglion; to evaluate the effects of decompression; and to evaluate the antinociceptive activity of the B vitamins using chronic compression of dorsal root ganglion model.

METHODS

Seventy adult, male, Sprague-Dawley rats were used in the experiment. Chronic compression of dorsal root ganglion

was produced in 56 rats by surgically implanting stainless steel rods unilaterally into the intervertebral foramen at L4 and L5. The rods were withdrawn from 12 rats on day 7 and from another 12 rats on day 14 postoperatively. Another 12 chronic compression of dorsal root ganglion rats received injection of B vitamins (VB, i.p. 0.1 ml/100 g, containing 3.3 mg thiamine and 0.05 mg cyanocobalamin) immediately after surgery, then daily for 3 weeks. Fourteen rats were used for control. Hyperalgesia was evidenced by the significantly ($p < .05$) decreased threshold and shortened latency of foot withdrawal to mechanical (von Frey filaments) and thermal (radiate heat) stimulation of the plantar surface. Intracellular electrophysiological recordings were obtained in vitro from the L4 and/or L5 dorsal root ganglia.

RESULTS

The chronic compression of dorsal root ganglion rats exhibited a rapid-onset (≤ 1 day), long-lasting (~ 10 weeks), mechanical and thermal hyperalgesia. The electrophysiological studies clearly reflect that the dorsal root ganglion cells from chronic compression of dorsal root ganglion rats were more excitable than that from control. The increased excitability was judged by the significantly ($p < .05$) lowered threshold current and action potential threshold, and the increased number of discharges evoked by depolarizing current. Chronic compression of dorsal root ganglion-induced

thermal hyperalgesia was significantly alleviated by decompression and rod removal. It was reduced >80% within 1–2 weeks and 3–4 weeks after the rod removal on the 7th and 14th day, respectively. The neural excitability examined 2–4 weeks after the rod withdrawal decreased significantly and closer to that in control. Repetitive application of VB inhibited hyperalgesia 40–50% during the first 2 weeks. The antinociceptive effect was seen in the next day test. The hyperalgesia became less and less and then disappeared after 5–6 weeks. Inconsistent with the findings in behavior, the neural excitability was lowered in the VB-treated chronic compression of dorsal root ganglion.

CONCLUSION

Chronic compression of dorsal root ganglion produced mechanical and thermal hyperalgesia. The intrinsic alterations in electrophysiological properties of dorsal root ganglion neurons potentially contribute to this chronic pain. Decompression of the compressed ganglia can effectively release the chronic pain. The B vitamins, thiamine and cyanocobalamin produced antinociception in this model, suggesting that repetitive application of B vitamins may be reasonable for treating chronic pain resulting from some diseases or injuries of the nervous system.



Faculty Views on Student Assessment Implications of Survey Results

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The challenges of developing a cohesive assessment system for chiropractic clinic students that incorporates both formative and summative evaluations are many. Not only must strategies be developed to evaluate the multiple and varied skills necessary for a graduate doctor of chiropractic, but these must be developed in light of fiscal resources and available professional personnel. The faculty clinician has the best sense of student progress in the clinic through direct observation of student/patient interaction and through faculty student conferences regarding documentation and patient management. Therefore, the faculty clinicians should have a major role in determining this assessment process. As part of an ongoing process to develop a cohesive assessment system in a large chiropractic teaching clinic system, a survey was conducted of clinic faculty. The purpose of this survey was to gauge the opinions of clinic faculty with regard to what skills and attributes are assessed, the timing of the assessments, and the obstacles to implementation of the assessment process.

MATERIALS AND METHODS

The faculty survey was divided into four sections. The first section used a 5-point Likert scale to rate perceived importance of assessing different skills in the clinic system. These included adjusting, communication, documentation, clinical evaluation, management, and professionalism. The second part of the survey was a short section soliciting opinions on the frequency that skills should be evaluated. The third section asked the faculty to identify the three major obstacles to conducting student assessment. The fourth section was for written comments. Thirty-one faculty clinicians were requested to complete the survey.

RESULTS

Twenty-five surveys were returned. There was the highest level of agreement that adjusting skills and completeness and clarity of records must be evaluated. Lowest scores were given to evaluating student appearance. Lower scores were also given to program of care and patient compliance. The faculty felt that documentation deserved the greatest frequency of evaluation followed by adjusting skills. Professionalism was felt best evaluated on a trimesterly basis. Time was identified as the biggest obstacle doing evaluations, followed by a lack of clear guidelines.

DISCUSSION

A current tool used to evaluate students in the clinic system is a per-visit evaluation that rates the students on the adjustment, patient interaction, documentation, and professionalism using a 5-point scale. Based on the outcome of this survey, a new per-visit instrument is being prepared. This instrument has two sections. The first is the documentation section; the categories of mastery level, acceptable, revise, and rewrite are used with subcategory checklists available. The second is the adjustment section; this uses mastery level, expected level, below expected level, and review. Here again are subcategory checklists. A separate instrument that focuses on professional and communication skill will be designed for trimesterly evaluations.

This outcome is directly related to the faculty's priorities as indicated by the survey. The new per-visit instrument focuses on what the faculty deem most important. In addition, the instrument is an attempt at addressing the issues of

time and clear guidelines, the largest obstacles to assessment identified by the faculty. This survey provides data for use in developing the assessment process. Knowing what skills and attributes that are perceived by clinic faculty as the most important to evaluate helps in defining the assessment system.

CONCLUSION

Clinic faculty are a resource that should be involved in shaping a student assessment process. This is an example of how the results of a faculty survey are being used to refine the assessment system at this institution's clinic.



Consistency in Examiner Rating of Student Performance During Spinal Manipulation

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The development of skilled spinal manipulation historically involves repetition of choreographed maneuvers of patient positioning, rehearsal of movements, and force development, all involving instructor feedback. Cognitive understanding of the subtask components is required to achieve goal-related movement. Understanding of the procedures and criteria for evaluation are based on communication of instructor judgment and experience as well as feedback. Yet, instructor backgrounds are frequently varied. Consistency and variability of instructor knowledge and proficiency may impact the student training experience. This study was designed to quantify instructor ratings of student performance during spinal manipulation and to determine inter-rater consistency.

METHODS

The experiment consisted of a prospective cohort study comparing the ratings of performance by students over a single trimester. All students were trained in high-velocity, low-amplitude (HVLA) procedures (one cervical, one thoracic, and one lumbar) as a part of the standard curriculum. Thirty-eight students met inclusion criteria and signed informed consent. Subject exclusion included disinterest, prior spine surgery, or contraindication to HVLA. Subjects were paired randomly at the beginning, middle, and end of the trimester. For each test, the subjects served as simulated patient or simulated doctor on a random basis and then exchanged roles. Subject pairs were consistent for all tests.

For each test, the simulated doctor positioned the simulated patient sequentially and delivered a HVLA to the L5, T7, and C2 segments. Performance was rated independently by three technique faculty members. Ratings were formalized using a quantified reference standard for spinal manipulation.

The reference standard included five descriptors (fast, force, precision, confident, comfort) set each to a 10-cm visual analogue scale. With the performance of a HVLA procedure, the faculty member would rate each descriptor. Raters were blinded to each other's ratings. Once rated, each form was turned in and filed for decoding at the end of the semester. Instructors were asked to abstain from use of the formal descriptor rating system other than for data collection in this project.

Rating scores were obtained by measuring the distance from 0 in millimeters. A composite rating was constructed as an average of scores for all five descriptors. Generalizability coefficients (G) were calculated to compare how closely each rating faculty member scored the performance of spinal manipulation.

RESULTS

Overall, faculty agreement was only fair (Composite G = 0.679) for the first rating of performance. Each subsequent use of the rating instrument was associated with improved agreement so that by the third use, all three faculty members had excellent agreement across all but one descriptor (Composite G = 0.906). The most difficult parameter for faculty evaluation was that of "Comfort," which only reached a level of good agreement (Comfort G = 0.705) at the end of the project.

DISCUSSION

Consistency of rating performance of manipulation has been shown to be only fair when done on an "ad hoc"

basis. With use of a systematic rating system tied to a generalizable reference standard, the agreement between raters progressed to excellent over a short time span. Ability for a faculty to demonstrate internal consistency in rating student performance would seem a valuable asset. Consistent ratings permit valid development of systems to improve the quality of training provided and thus the final quality of care for the patients they serve.

CONCLUSION

Performance of faculty in rating student skills in spinal manipulation may have significant variation. Use of a formal rating instrument tied to a generalizable reference standard can improve that performance and help standardize student training programs.



Defining a Reference Standard for Performance Characteristics in Spinal Manipulation

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Development of skill in spinal manipulation, as with any manual task, begins with the ability to replicate a sequence of actions on demand. Historically, training in spinal manipulation/adjusting, like other manual skills, has used various methods to qualitatively determine student performance. They include, among others, faculty demonstration, student rehearsal of choreographed postures, examiner observation and rating of performance, and mechanical aids that limit positions, loads, or displacements (e.g., toggle boards) in various ways. Each method of student assessment implies an underlying reference standard for performance that is unacceptable, acceptable, and exemplary. For manual treatment methods in general, the elements of skilled performance have been discussed conceptually. Descriptions are vague (e.g., quick, sudden, carefully dosed, low-amplitude force) and do not lend themselves to research applications. To date, no generalizable definition exists for the description or characteristics of acceptable performance of spinal manipulation. Others have used a formal consensus process to develop a list of characteristics for what constitutes a “good” manipulative procedure as a part of their study of biomechanical characteristics separating novices from experts. The purpose of this study was to determine the generalizability of the characteristics defining skilled manipulative procedures as a standard of reference for evaluating performance.

METHODS

Formal Delphi and Nominal Group processes were used to develop consensus on descriptors for the conceptualization of a “good” performance in the delivery of a high-velocity, low-amplitude (HVLA) spinal manipulation. In a previous study, patients, students, faculty, and practicing doctors were surveyed for a list of words that each person perceived was a descriptor of a “good” spinal manipulation. A panel

of faculty was convened by Nominal Group method to consider the list and to collapse disagreement among terms into the smallest list possible. For this study, three doctors with experience ranging from 4 to 16 years and currently teaching spinal manipulation procedures to students enrolled in a chiropractic college participated in a formal Delphi and Nominal Group process in a single sitting. Each was asked to nominate 10 nonoverlapping terms that expressed their conception of a “good” HVLA performance. The individual lists were consolidated and disagreements in terms were collapsed during active discussion among the participants. The principal investigator, while active in both studies, acted as recorder and did not participate in any of the discussions. The final list of descriptors was contrasted with that from the original group.

RESULTS

A total of 30 terms were submitted by the panel participants for consideration. Terms were consolidated into five independent descriptors by Nominal Group process. The remaining terms considered to describe the qualities of a “good” procedure included fast, force, precision, confident, and comfort. Comparison of these terms with the original group from the report of Cohen et al. demonstrated an 80% agreement with the final term representing a derivative of the remaining term from Cohen.

DISCUSSION AND CONCLUSION

Two independent groups of professionals have considered the question of descriptors for quality of performance in

administering high-velocity, low-amplitude spinal manipulation. The result represents strong agreement on the qualities necessary. These descriptors may now serve as a reference

standard, both qualitative and quantitative, for future research in training and outcomes studies related to the use of spinal manipulation.



Developing Skilled Performance of Spinal Manipulation/Adjustment

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Common wisdom holds that successful care is influenced by the skill of the treating doctor. Credentialing criteria often include parameters related to the frequency of performing procedures. Patients ask if the chiropractor frequently has performed procedures prescribed. An important factor for selecting a doctor is their qualifications. Jurisdictional control (e.g., a profession's authority versus a competitor's) relies on the demonstration of skill and effectiveness.

Spinal manipulation/adjustment is inherently mechanical, applying loads to the spine and inducing motions. It has been previously demonstrated that physicians trained but unpracticed in procedures were no different than novice manipulators in performance. If skilled performance is related to outcome, can methods of training be harnessed to improve it, optimize results, and minimize complications? As yet, there is no objective means to assess skill; therefore, the contribution of skill to outcome remains undefined. This project tested the strategy of rehearsal and quantitative feedback as a means of enhancing skill development using a standard reference performance criterion.

METHODS

An instrumented treatment table (Leader 900 Z with AMTI) recorded manipulation loads acting on an imbedded force plate. Inverse dynamics estimated the loads transmitted at the L5 disc. Performance of HVLA by two groups of students was compared over one trimester. All students were trained in select procedures in the standard curriculum. Students were randomly assigned to one of two groups. In the first group, 19 subjects followed the standard curriculum training. The second group consisted of 20 subjects who used the hand held Dynadjust instrument, providing automated feedback, adding a daily rehearsal (home practice using 10 repetitions each). Student performance of test procedures was measured at the beginning (T1), middle (T2), and end of the trimester (T3). Difference scores were calculated between test intervals T1, T2, and T3 and tested statistically by Student's *t* and Fisher's exact tests. Primary outcomes included changes

in preload, peak amplitude, slope, and direction of load application.

RESULTS

Lumbar

Peak amplitudes demonstrated significant differences by group. Preload improved 10.5% for standard curriculum and 52.5% for Dynadjust instrument group ($p = .0009$). The standard curriculum amplitude increased for transverse force ($p = .0439$). The Dynadjust instrument group significantly changed for sagittal force ($p = .0229$) and lateral bending moment ($p = .0182$). The rate of loading decreased 79.3 N/s (± 435.6 N/s) for the standard curriculum while the Dynadjust instrument showed a 742 N/s (± 345.2) increase ($p < .0001$). The flexion rate decreased (50.2 ± 120.4 Nm/s) in the standard curriculum but over 3 times as much (173.2 ± 32.4 Nm/s) for the Dynadjust instrument ($p = .0074$). Lateral bending slowed 135.4 Nm/s (± 286.9 Nm/s) in the standard curriculum but increased (210.2 ± 29.11 Nm/s) in the Dynadjust instrument ($p < .0001$).

Cervical and Thoracic

Similar results were observed in the cervical and thoracic procedures. Amplitudes were significantly different based on training ($.00458 < p < .0773$). Rates and durations likewise differed ($.0024 < p < .0745$).

DISCUSSION

A skilled task requires the ability to produce specific action on demand. Advanced skill can moderate actions to accommodate complex problem solving. Home rehearsal with automated feedback creates larger differences in performance than standard curriculum training, more rapidly increasing the level of skill.

CONCLUSION

Independent quantitative measures were used to assess results of training. Students using the Dynadjust instrument

demonstrated significantly greater change in performance of select HVLA procedures. Future work is likely to result in optimizing training and permit even greater improvement.



Obtaining Predictable Lumbopelvic Loads During Spinal Manipulation

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Spinal manipulation has become more widely used for the management of spine-related pain over the past two decades. More elder patients with degenerative disease, osteoporosis, and prior spinal surgery are receiving treatment than ever before. Few epidemiological data are available with respect to potential risks of these procedures as a function of patient comorbidity. However, common clinical practice provides for modifications to manipulative procedures to accommodate structural changes associated with disease and surgery. This project was devised to systematically explore modifications to manipulation procedures in order to understand how to systematically control loads acting on the spine. Earlier work suggests that patient postures and experienced manipulator effort can alter the loads that the spine undergoes. Quantitative knowledge of these parameters may be helpful in preventing complications from this treatment in patients who are older or have complex spinal conditions.

METHODS

This study was conducted in three parts. First, loads acting on the lumbopelvic region during typical high-velocity, low-amplitude procedures were measured using a specially instrumented treatment table described previously. A standard treatment table (Leader Health Technologies, Inc. Port Orchard, WA) was modified to incorporate a force plate capable of measuring reaction loads. Load transformation equations were used in conjunction with distance estimates (± 1 cm) from the force plate center to the L5/S1 disc to quantify the loads transmitted through the lumbopelvic junction. Fidelity of the table-force plate system in reporting accurate reaction loads was independently confirmed. The typical procedure used for this study was defined by averaging the measured loads from 22 procedures performed on 11 volunteer subjects by six physicians with experience ranging from 1.5 to 24 years. Using a load-transformation computer modeling technique, the effects of systematic variation in patient posture were estimated. Second, relative intersegmental postures associated with lumbopelvic flexion

and lateral bending were quantitatively defined. Five subject volunteers (age 37 ± 9.3 years) completed informed consent and participated in the study. Intersegmental motions of the lumbar spine were obtained separately by positioning the lumbopelvic region according to feasible treatment extremes in flexion, extension, and lateral bending while in a fluoroscopic C-arm. Displacements at the L3/4, L4/5, and L5/S1 disc levels were determined from digitized fluoroscopic images. Systematic intersegmental displacements from the measures were introduced to the computer model in the third step of the study, using small angle increments until the total range of displacements was achieved. Results were associated with specific postural variations.

RESULTS

The matrix of three dimensional rotations derived from fluoroscopic measures included flexion ($0 < \alpha < 9.2$), axial rotation ($0 < \beta < 55$), and lateral bending ($-10.2 < \delta < 17.2$) defined in terms of reference to the initial anatomical position. Postural variation resulted in sequential transition in the amplitudes of force and moment components acting on the lumbopelvic spine that range from 25% to 261%. In the case of shear force acting across the spine from left to right (frontal plane), the direction of loading could be modified without changing the input manipulation load.

DISCUSSION

Quantitative knowledge of this type is useful in understanding the applications and limitations of manipulative procedures. These type of data can now be used in further computer modeling to explore how these procedures might affect patients with complex or postsurgical changes. Such models limit the risk to patients while maximizing information that can help develop realistic and safer treatment protocols.

CONCLUSION

Systematic modification of patient posture theoretically may be used to control the amplitude of select

components of manipulation loads acting on the spine. Capacity of operators performing these procedures to intentionally achieve specific loads systematically may now be assessed.



How Well Does Lumbar Fusion Preserve Physiologic Lordosis?

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Several recent studies have demonstrated that a statistically significant difference exists between the sagittal geometric configuration of the lumbar spine in normal pain-free subjects versus chronic low back pain patients. On average, chronic low back pain patients demonstrate reduced magnitudes of distal lumbar lordosis as compared to their normal pain-free counterparts. Although spine surgeons generally believe that they do an adequate job of maintaining physiologic lordosis after fusion surgery, little is actually known about whether or not lumbar fusion surgeries result in anatomic alignments that are considered near the optimum magnitudes suggested by recent scientific investigations. We wished to explore the magnitude of lordosis that was achieved in a retrospective consecutive case analysis of patients receiving lumbar spine fusion surgeries and compare these findings to those values found in a normal pain-free group of subjects and a group of nonsurgical chronic low back pain patients.

METHODS

A retrospective review of weightbearing lateral lumbar radiographs and medical records of 50 consecutive patients receiving lumbar fusion for low back pain secondary to degenerative disc disease ($n = 36$) or spondylolisthesis ($n = 14$); 50 normal subjects having no history of low back pain, back trauma, or treatment for any spine or spine-related condition; and 50 nonsurgical chronic low back pain patients was performed. Measurements were made on the radiographs of all subjects to assess overall sagittal spinal alignment between L1 and S1 and intersegmental sagittal alignment at L1-L2, L2-L3, L3-L4, L4-L5, and L5-S1. In the patients receiving fusion, 33 received interbody fusion procedures with cylindrical cages, 13 received posterior rod and screw instrumentation, while 4 patients received 360° fusion with both anterior cages and posterior rod and screw instrumentation.

RESULTS

The average magnitude of overall lordosis measured between L1 and S1 for the fusion patients was 58.9°, 59.6° for the chronic low back pain patients, and 72.6° in the normal subjects. Overall average segmental contributions to lordosis were: L1-L2 = 4.3° surgery patients, 0.3° chronic low back pain patients, and 4.1° normal subjects; L2-L3 = 7.8° surgery patients, 5.3° chronic low back pain patients, and 7.6° normal subjects; L3-L4 = 10.3° surgery patients, 9.6° chronic low back pain patients, and 11.7° normal subjects; L4-L5 = 12.6° surgery patients, 14.3° chronic low back pain patients, and 16.8° normal subjects; L5-S1 = 23.9° surgery patients, 30.1° chronic low back pain patients, and 33.0° normal subjects.

DISCUSSION AND CONCLUSION

Overall lordosis for the surgery patients and the nonsurgical chronic low back pain patients was almost identical, while the pain-free subjects had an average of 13° greater magnitude of overall lordosis. Distal lordosis between L4-L5-S1, where most of the surgical fusions occurred, was on average 13° less for the surgery group as compared to the normal subjects and was approximately 7° less than the chronic low back pain group's distal lordotic curve. These findings suggest that surgical fusions do not preserve overall lordosis at magnitudes that approach those of asymptomatic controls. This appears to be irrespective of the type of fusion performed. Additionally, our data suggest that fusion does not preserve physiologic lordosis at the fusion site at magnitudes that approach even those found in nonsurgical chronic low back pain patients. Aspects of surgical procedures that may affect the depth of lumbar lordosis may need to be reassessed if establishing better anatomical and physiological alignment is to be achieved after surgery. These aspects may include patient positioning during the procedure, surgical technique, type of instrumentation used, and postsurgical rehabilitation.



A Conflicted Process CMCC/York Affiliation 1994–2001

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The purpose of this paper is to describe the recent breakdown (March 2001) of affiliation efforts between the Canadian Memorial Chiropractic College (CMCC) and York University. In its present configuration discussions between them had been ongoing since 1995 when their respective presidents exchanged letters of intent. These letters were followed by a series of meetings with faculty at York and representatives of the Senate appointed bodies. These meetings led in turn to a task force which found the affiliation worthy of pursuit until, in May 1998, York's Senate voted to approve-in-principle the affiliation with the CMCC. This approval had two interesting conditions. CMCC would raise the funds to build its new school on York's campus and CMCC would remain administratively independent of York. Some faculty members feared that affiliation would tarnish the reputation of the university. While there are many other arguments swirling around this question it seems that the issue of reputation is paramount.

METHOD

The empirical data for this research are based on a set of unstructured interviews with members of the Canadian Memorial Chiropractic College, a focus session with the faculty members of the Higher Education Group of the Theory and Policy Studies department of Ontario Institute for Studies in Education/University of Toronto (OISE/UT), a set of e-mail-based discussions with selected adult educators at OISE/UT, as well as a review of relevant documents. These conversations are viewed in the context of the history of efforts at affiliation for CMCC.

RESULTS

It is fairly clear that a segment of university faculty are concerned about maintaining exclusive rights to knowledge production. The process of a professional school becoming accepted into a university setting, at the cusp of the millennium, is still fraught with the kinds of challenges based on the exclusivity practiced by a guild mentality. This is

a particular problem if the professional school challenges accepted notions of the dominant paradigm. While issues of safety and efficacy are espoused, the underlying theme is academic respectability. This research examines the notions of political control of knowledge production and resistance in the contested affiliation effort. It is clear that the most effective and coherent effort was mounted by those who opposed the process.

DISCUSSION

CMCC had little to do with all these processes other than to observe them in frustration. From CMCC's perspective, a number of factors contributed to the stalling of the process, including the precise nature of the affiliation relationship, the introduction of residency requirements partway through the process, the difficulty of locating a host faculty, and two of the longest strikes in Canadian university history. Innocently, CMCC had been proceeding along the mandate set by York's agreement-in-principle and the Senate processes which were based on them.

CONCLUSION

In the politics of the academy CMCC will need to create a sense of distance between it and some elements of the profession without driving a wedge between the various groups. Perhaps the way to deal with these irreconcilable differences is to study them as publicly, thoroughly, and objectively as possible. Conferences, long-term researches, and various forms of ongoing discussion on the heart of these matters would provide the only way to continue to tread this narrow strategic line. All these studies and conferences should, of course, be done by chiropractors in conjunction with a multitude of other health providers. There is also far too much substance to chiropractic, and indeed subluxation theory, for the College to simply choose sides. It is not the role of an educational institution to legislate thought, but rather to encourage it.



Chiropractic Evaluation and Treatment of an 86-Year-Old Female with Exertional Chest Pain Unresolved After Triple Bypass Surgery

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The purpose of this study was to present the history, findings, and response to chiropractic care of a patient with exertional chest pain that was unchanged following triple bypass surgery.

CLINICAL FEATURES

An 86-year-old female patient complained of exertional posterior chest pain that radiated bilaterally to her anterior chest with physical exertion. Her pain was decreased with rest, taking a deep breath or by nitroglycerine. The complaints began approximately 18 months prior, and were complicated by high blood pressure. She had undergone triple bypass surgery for the complaints without any improvement in symptoms. She was able to walk 100 yards and then needed to stop due to increased symptoms.

INTERVENTION AND OUTCOME

Treatment consisted of chiropractic adjustments delivered to her cervical and thoracic spine. The patient experienced resolution of symptoms and a return to physical activity that included the ability to walk up to 2 miles without developing symptoms.

CONCLUSION

Hopefully, future investigations into this patient population will shed light on the relationship between chiropractic adjustments and exertional chest pain.



Management of Idiopathic Scoliosis Based on the Copes Scoliosis Treatment Recovery System A Case Study

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The management and treatment of idiopathic scoliosis have always been challenging to health care practitioners. Chiropractors attempt to halt the progression of the spinal curvature using electric muscle stimulation, spinal manipulative therapy, and rehabilitative exercise. Orthopedic surgeons typically monitor the progression of the curve, brace, and surgically implant fixation devices. Complications of such invasive procedures include infection, and often follow-up surgery is required in order to effective the often-refractory nature of this disorder. The lack of an evidence-based treatment protocol in both chiropractic and orthopedics, coupled with the inherent risks of allowing the curve to progress, such as cardiopulmonary complications, degenerative arthritis, and debilitating pain, stimulates the study of conservative treatment options, such as the Copes Scoliosis Treatment Recovery System (STRS). The purpose of this study was to evaluate the effect of the Copes STRS protocol in a 12-year-old female patient.

METHODS

A 12-year-old female idiopathic scoliosis patient with three lateral spinal curvatures underwent treatment as outlined by the Copes STRS program for 12 months. Radiography in lateral bending positions was used to predict the amount of spinal correction. The patient was cast-fitted for the Copes STRS brace. The STRS brace contained five air vectors that were filled with additional air every 6 weeks. The brace was worn every day for 18–20 hours. Treatment was received three times per week including stimulation of alpha muscle fibers at medium frequency for 18 minutes, ocular-vestibular therapy for 20 minutes, intersegmental traction with the patient braced using motorized flexion distraction for 20 minutes, and spinal manipulative therapy. The patient performed flexibility and stabilization exercises daily. Hydrotherapy was received at home daily. The patient was

Table 1. Radiographic progression of scoliotic curve

	Initial	6 Months		9 Months		12 Months	
		In brace	Out of brace	In brace	Out of brace	In brace	Out of brace
Upper thoracic	33	32	35	33	31	31	30
Midthoracic	43	43	53	45	46	41	40
Thoracolumbar	24	13	17	12	16	12	13

reevaluated at 6, 9, and 12 months using AP full-spine radiographs in the STRS brace, and without the brace fitted.

RESULTS

Initial X-ray findings revealed an upper thoracic curve from T1 to T5 measuring 33°, a midthoracic curve from T6 to T11 measuring 43°, a thoracolumbar curve from T12 to L4 measuring 24°. Lateral bending films revealed a possible correction of the upper thoracic curve to 23°, the midthoracic curve to 16°, and the thoracolumbar curve to 0°. At 6, 9, and 12 months, the three curves were measured in degrees (see Table 1).

DISCUSSION

Unfortunately, once active in the program, patient compliance may decline due to a demanding routine and lack of resources which was not the case in this particular study.

Education regarding various treatment options including benefits and risks does help to establish a more acquiescent patient and with more research into the benefits of this conservative method of treatment and future study of its cost-effectiveness, perhaps more health insurance providers will cover Copes STRS. Although a reduction in all three curves has been recorded to date, the midthoracic curve of this patient did increase during the initial 6-month period, which was attributed to a growth spurt. The patient was encouraged to receive monitoring from her orthopedic surgeon. Further reduction in the three spinal curvatures to the predicted initial corrections will be monitored over the next 36 months.

CONCLUSION

The Copes STRS appears to offer promise in the conservative management of idiopathic scoliosis. The results of this case study are encouraging and suggest that further research, such as a randomized controlled trial, is necessary to determine the efficacy of this approach to management of the idiopathic scoliosis patient.



Lumbar Segmental Flexion Induced by Side Posture Positioning for L5 Adjustment

Raymond A. Wiegand, D.C., Logan College of Chiropractic

The purpose of this study was to investigate whether the L5 side posture setup position induced lumbar segmental flexion particularly at L5/S1; to determine whether or not a reserve range of flexion motion exists beyond the setup position; and to determine whether the data support the theory of a safe zone through which additional flexion loading could be applied during the adjustment thrust without undue patient risk of disc injury.

METHOD

Twenty healthy subjects were recruited for the study. Radiographs of each subject were taken in a side posture L5 setup position, a standing neutral lateral view, and a standing flexion

view. Ten of the setup positions were done by an instructor of diversified technique with 30 years of experience and 10 were done by a private practitioner of 3 years' experience. Motion segment measurements from the radiographs were obtained using digital data point transfer of specific osseous landmarks. For each motion segment L1/L2 through L5/S1, the range of motion (ROM) from the neutral to the setup position was compared to the full ROM. This comparison yielded a calculation of reserve range of flexion motion.

RESULTS

One subject was removed from the study due to poor quality radiographs and an inability to identify the osseous

landmarks. Of the remaining 19 subjects, the following is reported of the orientation of the L5/S1 motion segment in the L5 setup position: one subject was flexed 2.8° beyond full ROM, six subjects demonstrated a position of full flexion, and 12 subjects demonstrated 3.81° SD ± 3.7° of flexion in comparison to their average ROM of 10.3° SD ± 4.2°. In this last group of 12, an average difference of 6.5° SD ± 3.9° of flexion was recorded between the setup position and the full ROM value. L1/L2, L2/L3, L3/L4, and L4/L5 also demonstrated similar positional characteristics at the L5 setup position. These motion segments on average were in a position of less than 50% of their active ROM value. A comparison of the setup positions between the two doctors revealed a 26% increase of reserve motion segment flexion at L5/S1 of the chiropractor with 30 years' experience.

These results demonstrated that all motion segments moved into partial flexion as a result of the L5 side posture setup. With respect to the L5/S1 motion segment, one subject demonstrated L5/S1 in a passive ROM position. This subject

potentially had no flexion reserve. Six subjects demonstrated L5/S1 in a position of full flexion. In this group, passive range of motion might exist as a flexion reserve. In 12 subjects, L5/S1 was usually found flexing only 31% of its full flexion ROM leaving a 69% potential flexion reserve.

DISCUSSION

The finding of an actual flexion reserve in 63% of the subjects and a potential flexion reserve in 31% of the subjects suggests that the side posture L5 setup does not present an undue risk to the patient for L5/S1 disc injury from excessive flexion loading. It is also speculated the same is true of the adjustment thrust for the reason that additional flexion loading would be transmitted through and or absorbed by the motion segment in the flexion reserve.



Changes in Heart Rate Variability in Healthy Human Subjects on a New Bicycle Seat Versus Traditional Bicycle Saddle A Pilot Study

John Zhang, Ph.D., M.D., **Michael Clover**, D.C., and **Joe Unger**, D.C., Logan College of Chiropractic

The ergonomics of bicycle riding for leisure or sports have been studied extensively. The traditional bicycle seat exerts pressure on the underlying tissue that can cause low back pain, sciatica, numbness of the legs and feet, as well as more complex problems, such as impotence in male riders. A newly designed seat changed the weightbearing areas in an effort to improve riding comfort and efficiency.

OBJECTIVE

The aim of the present study was to assess the effects of riding bicycle on the new seat on the sympathovagal control of heart rate variability in normal human subjects. The outcome assessment of the study was heart rate variability, an indicator of activity of the autonomic nervous system that has been used in healthy human subjects before and after bicycle riding.

METHODS

Eighteen healthy human subjects participated in this study by riding a bicycle fitted with the new seat and the traditional

seat. The heart rate variability was evaluated using Biopac 100 System for ECG recording before and after the bicycle riding each day for 15 minutes. Three heart rate variability frequency bands were analyzed using DADiSP software.

RESULTS

A significant increase in the heart rate was seen in both the new and traditional seat groups ($p < .05$) after exercise. The heart rates in the new seat group were 79.90 ± 13.74 before and 90.74 ± 18.73 ($p < .05$) after riding on the bicycle. The total power and very-low-frequency band in the heart rate variability analysis with the new seat did not show significant changes. The low-frequency component in the new seat group was significantly decreased from 1612.36 to 670.08 ms^2/Hz before and after riding the bicycle. The high-frequency component in the new seat group was significantly decreased from 304.65 to 131.16 ms^2/Hz before and after riding the bicycle. In the old seat group, the high-frequency component increased from 230.10 to 257.51 after riding the bicycle. The low-frequency band did not show significant changes in the traditional seat group. The low-frequency to high-frequency ratio was increased in both the new and the traditional seat groups.

DISCUSSION

The sympathetic nerve activity is represented by the high-frequency component. There were no significant changes of the high-frequency component in the traditional seat group. Subjects in the new seat group showed a decrease in the high-frequency component. This was contrary to the increased heart rate which was an indication of increased sympathetic activity in the new seat group. When this finding was compared to the parasympathetic activity represented by the low-frequency component, it was noted that the low-frequency component was significantly reduced. The ratio of reduction of the low-frequency component was greater than the ratio of the high-frequency component. Therefore, the increased heart rate was not due to an increase in the sympathetic activity but a reduction of the parasympathetic activity

in the new seat group. However, a short-term heart rate variability study using bicycle stress test has found that age and heart rate are the main determinants of heart rate variability rather than regular physical activity. On the other hand, heart rate has been found to be stable before and after a training season in elite cyclists.

CONCLUSIONS

The newly designed bicycle seat affected the subjects' heart rate variability in both the low-frequency and high-frequency bands but not the traditional seats. The major change in the heart rate variability was a greater reduction of parasympathetic activity after riding on the newly designed bicycle seat.



Chiropractic Success Survey

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Career success has been studied in different disciplines in medical professions, physical therapy, and business. However, this issue has not been researched in chiropractic mainly because of the complexity of defining success in chiropractic. The purpose of the study is to investigate important factors that affect alumni's feeling about what defines career success in chiropractic.

METHODS

This study was conducted through the use of a questionnaire which measured the alumni's feelings toward career success. The questionnaire contains 31 questions ranging from demographic factors to factors defining career success. Alumni attending an annual meeting were given the questionnaire with no prior knowledge of the survey to ensure that their responses were spontaneous and reflected their true feelings. Frequency analysis, mean values, standard deviation, and ANOVA were used for the statistical analysis.

RESULTS

A total of 86 alumni (80% male, 20% female, representing 2.1% of the alumni population) completed the questionnaire. Both male and female alumni selected indicators such

as being a good husband, wife, or parent; practicing ethically; improving patient health; and feeling satisfied over high income or status when describing career success. High income was ranked as only mildly important (an average of 2.59 on a scale of 1–5). Among the 86 alumni, 24.7% reported an income between \$50,000 and 100,000, 18.8% with income between \$100,000 and 150,000, and 31.8% with income more than \$150,000. The other 23.7% had income below \$30,000 a year or did not answer the question. The least important factors in career success considered by the alumni were ownership of more chiropractic offices, appointment or election to a leadership position, being an important alumnus, and providing of free services or services at reduced fees. When the 86 alumni were asked how did they rate their level of success, 43.5% considered themselves very successful and 37.6% reported as successful. Only 4.7% reported as very unsuccessful and 8.2% unsuccessful. Among the four alumni reported being very unsuccessful, two had income below \$30,000 and two had income between \$50,000 and \$100,000.

DISCUSSION

Chiropractors in this survey associated internal indicators such as practicing ethically, improving patients' health, deriving personal satisfaction, and achieving personal goals as more significant in career success than external factors

represented by items such as high income, attaining executive status, and being an important alumnus. Most chiropractors surveyed described themselves as successful. The five most important factors for success were defined as being a good spouse or parent, ethical practice, improvement of

patient health, personal satisfaction from career, and latitude in handling work-related responsibilities. This information is useful for understanding alumni's feeling toward career success and further research is needed to improve chiropractic education to enhance career success.



The Effect of Examination and Imaging on Treatment Termination Decisions of an Independent Chiropractic Examiner

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Independent evaluations of patients receiving chiropractic care as a result of injuries received in motor vehicle accidents are routine in today's health care reimbursement system. Part of the assessment process used to determine the nature of a patient's condition is the use of radiographs and MRI studies, in conjunction with the physical examination. An apparently overwhelming number of MRI studies indicate positive findings (i.e., disc herniations, bulges). However, often patients who are examined are without symptoms or objective findings that correlate with the results of these diagnostic studies. In that the use of magnetic resonance imaging studies has increased over the years, this study was designed to test the correlation of physical examination findings with the results of MRI studies and to determine if these positive MRI findings support the determination to continue or terminate care of patients involved in motor vehicle accidents.

METHODS

This study was a retrospective review of the records of one chiropractic physician who had been requested to perform an independent chiropractic evaluation (ICE) of 380 consecutive persons who had been involved in motor vehicle accidents. All were referred by a single peer review company.

The physical examination focused on the assessment of spinal injuries, although additional musculoskeletal conditions were examined when warranted. The physical examination included ranges of motion, deep tendon reflexes, orthopedic tests, and static and motion palpation evaluations. The outcome from the examination was a recommendation from the examining doctor that the patient's chiropractic care should be continued or terminated.

Descriptive data were calculated on the whole data set. Correlations were calculated between examination findings and the ICE recommendation (care to be terminated or continued) using the contingency coefficient conducted on subsets of the data. The data were broken into four subsets comprised of subjects with presenting complaints in the

cervical or lumbar regions or headaches or other complaints. Alpha was set at 0.05.

RESULTS

A total of 380 patient files were reviewed for this study. Most subjects had both neck and lower back symptoms. The majority of patients had diagnostic testing prior to their ICE and had abnormal finding on their MRI. The examiner recommended to the insurance carriers that chiropractic treatment be terminated in the 92.9% (353) of the cases; thus, in only 7.1% (27) of cases was continued care recommended. No statistically significant correlations were found within any of the four data subsets for the recommendation for or against continued care and any demographic factor or with any diagnostic test (radiographs, MRI, or neuroelectrodiagnostics) except for a nondisk diagnosis made from MRI for a nonspinal condition. The decision to recommend continued care correlated in each data subset with the presence of any positive physical examination finding.

DISCUSSION

There is a growing body of literature showing that pathoanatomy does not correlate with a patient's symptomatology, signs, or dysfunction. Thus, imaging studies must always be viewed through the light of clinical information. This study supports the same conclusion. The imaging studies that patients had prior to their ICE did not appear to affect the determination of the ICE. In fact, it is apparent that the only important factor in making the determination to recommend continued care was the findings made by the ICE doctor himself.

Although most research has shown that physical examination is neither valid nor reliable and has very little predictive value, it still is the bedrock upon which physicians make judgments about patients. Such is the case in this study.

