ABSTRACTS OF ACC CONFERENCE PROCEEDINGS

Platform presentations

The Chiropractic Care of Children with Otitis Media: A Systematic Review of the Literature Utilizing Whole Systems Research Evaluation and Meta-synthesis

Joel Alcantara, International Chiropractic Pediatric Association, **Joey Alcantara**, private practice, **Junjoe Alcantara**, private practice

INTRODUCTION: In the era of evidence-based practice, physicians are challenged to provide evidence in support of the safety and effectiveness of their interventions. A systematic review of the literature on the chiropractic care of children with otitis media was performed.

METHODS: The following electronic databases were searched: MANTIS [1965–2008]; ICL [1984–2008]; Pubmed [1966–2008]; EMBASE [1974–2008], AMED [1975–2008], CINAHL [1965–2008], Alt-Health Watch [1965–2008] and PsychINFO [1965–2008]. Key words were otitis media and related words AND chiropractic. Eligibility criteria for review were: (1) the study was a primary report in a peer-reviewed journal; (2) the study population involved 18 years or younger; (3) the topic involved subjects with otitis media. A narrative review of the literature was performed augmented with a meta-synthesis on chiropractic management and the application of a Whole Systems Research (WSR) evaluation.

RESULTS: Our review revealed 19 articles. Fifteen studies were amenable to the WSR evaluation resulting in a score of 7.06 ("medium" quality). The meta-synthesis emphasized performing a history and physical examination including otoscopy to formulate a diagnosis. Activator, Gonstead, Toftness, Chiropractic Biophysics and Diversified Techniques were utilized with an emphasis on the upper cervical spine. One study involved cranial technique while two papers described a dietary intervention and another two papers utilized soft-tissue massage.

DISCUSSION: The Council on Guidelines and Practice Parameters rated the chiropractic care of children with otitis media with C: Limited evidence to support chiropractic care, including manual procedures, spinal manipulation/mobilization; benefit may be due to nonspecific factors. The findings of our systematic review with meta-synthesis and WSR evaluation emphasized clinical management strategies in the care of children with otitis media.

CONCLUSION: This review highlights need for more research incorporating new methodologies (ie, Whole Systems Research) reflective of the science, art and philosophy of chiropractic. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Chiropractic Care of Children with Enuresis: A Systematic Review of the Literature Utilizing Whole Systems Research Evaluation

Joel Alcantara, International Chiropractic Pediatric Association, **Joey Alcantara**, private practice, **Junjoe Alcantara**, private practice

INTRODUCTION: Whole Systems Research (WSR) was developed to evaluate complex systems of healthcare with attention to the process of healing and explicitly recognize the underlying philosophical/theoretical framework. In keeping with evidence-based practice, this systematic review of the literature on the chiropractic care of children with enuresis sought to evaluate the evidence based on a WSR perspective augmented.

METHODS: The following electronic databases were searched: MANTIS [1965–2008]; ICL [1984–2008]; Pubmed [1966–2008]; EMBASE [1974–2008], AMED [1975–2008],

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CINAHL [1965–2008], Alt-Health Watch [1965–2008] and PsychINFO [1965–2008]. Key words were enuresis, nocturnal enuresis, bedwetting and related words AND chiropractic. Eligibility criteria for review were: (1) the study was a primary report in a peer-reviewed journal; (2) subjects were <18 years; (3) involved subjects had enuresis. A narrative review of the literature was performed augmented with an evaluation using WSR evaluation.

RESULTS: Our systematic review revealed 7 articles. Six of the 7 studies were amenable to the WSR evaluation resulting in a score of 7.33 from a possible 11 points (rating of "medium" quality). Four case reports describe the care of children aged 8–14 years. Toggle recoil, SOT, Activator, Gonstead and Diversified Techniques were used to address lumbosacral segmental dysfunctions. A prospective cohort study demonstrated improvement in wet nights per week from baseline following 2 weeks of care. In a randomized clinical trial, within group comparison of pretreatment and comparative rates of enuresis subjects demonstrated an improvement.

DISCUSSION: The Council on Guidelines and Practice Parameters rated the chiropractic care of children with enuresis with I: No recommendation can be made because of insufficient or non-relevant evidence. Evaluation with the WSR checklist indicates otherwise with a rating of "medium" quality of the published literature.

CONCLUSION: This review highlights the need for more research incorporating new methodologies reflective of the science, art and philosophy of chiropractic. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Use of a Personal Response System to Embed Formative Assessment into Basic Science Lectures

Robert Appleyard, National University of Health Sciences

INTRODUCTION: Rather than limiting students to just knowledge and understanding in the pre-clinical basic sciences, a bridge to the higher level skills of clinical application and analysis can be established by embedding structured problems (i.e. case studies) into basic science courses. The challenge is to incorporate formative assessment along with structured problems to prevent incomplete or misunderstood facts and concepts from becoming ingrained. Although lectures provide an efficient medium to communicate basic science knowledge and understanding, formative assessment is difficult due to a deep seated reluctance of most students to volunteer answers to challenging questions.

METHODS: This describes the author's experience using a classroom technology referred to as "clickers" to incorporate formative assessment stemming from application and analytical questions embedded within basic science lectures in endocrine, respiratory, and cardiovascular physiology. Each student uses a handheld device (a "clicker") that enables wireless transmission to a central receiver of their choices from lists of answers to questions posed during the lecture. Responses are instantaneously compiled for immediate display via bar charts that are projected for the entire class to view. Individual students remain anonymous insofar as their own responses. This has been used for two consecutive trimesters with class sizes of 30 and 68 students. Questions emphasized clinical application and analysis based upon terminology and concepts presented in class.

RESULTS: Test scores derived from summative assessments almost identical to those used prior to incorporation of clickers were higher than average for the first class, but returned to the historical pre-clicker medians for the second class. Students reported a better sense of learning with use of the clickers, especially due to immediate in-class explanation of why certain answers were incorrect.

CONCLUSION: Clicker technology appears to provide a powerful method to introduce higher level problem solving and effective formative assessment into basic science lectures. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Chiropractic Care and Changes in Physical State and Self-Perceptions in Domains of Health among Public Safety Personnel: A Longitudinal Follow up Study

William Boone, Sherman Chiropractic College

OBJECTIVE: A previous pilot study was conducted with volunteers primarily from local fire and emergency services departments. The study was conducted to evaluate the impact of chiropractic care on the physical and self-perceived health related benefits of public safety personnel. Preliminary data regarding their care has been published. Over an average of 5.5 months, volunteers received routine chiropractic care at the college's clinic. Each subject was assessed on a weekly basis and adjusted by standard techniques when necessary.

METHODS: Physical assessments were conducted on 10 volunteers during the initial visit and at the re-assessment period. As well, a Health Related Quality of Life Survey (HRQL) was completed by each subject at the initial

assessment and the following reassessment. Physical assessments included: (a) visual postural analyses (6 tests), (b) cervical range of motion (6 tests), (c) lumbar range of motion (6 tests) (d), spinal balance and leg length (5 tests), (e) orthopedics (19 tests), (f) motor strength (11 tests), (g) deep tendon reflexes (5 tests), (h) superficial reflexes,(3 tests) and (i) sensory testing (14 tests). Positive tests were assigned a numeric of +1 and negative findings a zero. Self -perceptions were also assessed by Cohen's method of determining effect size (ES), or size of the clinical effect.

RESULTS: As a group, the ten volunteers decreased from an average of 16.0 positive findings to 9.5 positive findings, a statistically significant reduction ($p = 0.021$). In addition, volunteers' self-evaluations of HRQL domains included: physical well-being, mental/emotional state, stress management, life enjoyment, and overall quality of life, When tallied together over the average 5.5 months of care, these domains represented a significant change ($p = 0.040$). As well, a 6th domain, referred to as "combined wellness", representing the sum of the 5 domains, was also significantly improved ($p = 0.000$). The ES for improvement in all HRQL domains was large, $(0.81 + 0.44)$, ranging from 0.35 to 1.30.

CONCLUSIONS: The results of the preliminary study revealed that ten volunteers showed significant improvements in physical assessment findings and self perceptions in health related domains while undergoing an average of 5.5 months of chiropractic care. The changes also appeared to elicit a large clinical effect with regard to self-ratings. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Diagnostic Imaging Guidelines Implementation Study: A Randomized Trial with Postal Follow-Ups

André Bussières, Université du Québec à Trois-Rivières, **Louis Laurencelle**, Université du Québec à Trois-Rivières, **Cynthia Peterson**, University of Zurich

BACKGROUND: Implementation strategies of imaging guidelines can assist in reducing the number of radiographic examinations in acute care setting. This study aimed to compare the perceived need for diagnostic imaging among a group of Swiss chiropractors before and after an educational intervention strategy.

METHODS: 120 Swiss chiropractors attending a continuing education conference were randomized to receive either a radiology workshop, reviewing appropriate indications for diagnostic imaging studies for adult spine disorders, or a control group. The intervention group was further subdivided into three equal subgroups. All participants underwent a pre-test and a final test at 14–16 weeks. At midpoint, one subgroup was invited to review online recommendations initially presented during the educational workshop. Post-test performance was compared to one other subgroup. Chi-squared, ANOVA, and Student t tests were used. Differences were considered significant at $p < .05$. Measures of adherence were calculated using 95% confidence intervals.

RESULTS: There was no difference between scores obtained at baseline for the intervention group and the control group and overall scores for the pre-test and the final test for all four groups were not significantly different. However, the subgroup provided with access to an online PowerPoint presentation at 8–10 weeks performed significantly better than the subgroup with which they were compared ($F=4.486$, $df = 1$ and 30; $P < .05$). Guideline adherence was 50.5% (95% CI, 39.1–61.8) for the intervention group and 43.7% (95% CI, 23.7–63.6) for the control group at baseline. Adherence at follow up was lower but mean group differences remained insignificant.

CONCLUSIONS: Having online access to specific recommendations while making a clinical decision may favorably influence the intention to either prescribe or not prescribe diagnostic imaging studies. However, a didactic presentation alone in a group of trained professionals did not appear to change the perception for the need of diagnostic imaging studies. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Review of Legislation Pertaining to Unionization in Higher Education

Alana Callender, Palmer College of Chiropractic

BACKGROUND: Some chiropractic colleges already have unionized faculty and other institutions are considering this process.

METHODS: The author has reviewed the legislation from 1890 until today that has affected unions in higher education with special attention paid to the 1980 Yeshiva decision.

DISCUSSION: This review may clarify unfamiliar terms used by unionizers and administrators as they steer faculty toward or away from the unionization process. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Short-Term and Long-Term Alumni Satisfaction Surveys

George Casey, **Gerard Clum**, **Dale Johnson**, Life Chiropractic College West

INTRODUCTION: Identifying various alumni characteristics can lead to valuable impressions about the success of a chiropractic program, provide feedback to the institution on matters related to program quality and integrity and provide the opportunity to build or maintain relationships with graduates. A survey was administered to the 25-year Life West alumni to identify programmatic effectiveness over the history of the college and to compare the feedback of its earliest graduates with alumni data gathered from three, five and seven-year alumni cohorts of the surveys administered by the New York Chiropractic College in 2008.

METHOD: A scaled and blinded Zoomerang survey was developed utilizing eight of the seventeen educational questions from the New York survey. The survey was sent to 106 surviving graduates from the first graduating class of 118 students. Addresses, phone numbers and e-mail addresses were cross-matched with the records from the states in which each graduate is licensed as well as with Google and Yahoo searches for each alumnus. The study of results assesses similarities and differences in attitudes of graduates over time and draws inferences regarding Life West's chiropractic program.

RESULTS: Thirty-seven (37) alumni responses were received. The expression of the graduates' perception of professional success, career satisfaction and the value of their educational experience at 25 years is closely matched with the 3-year, 5-year and 7-seven graduates of the 2008 NYCC survey even though the curricula, the faculty, the facilities and the resources available to support the DC program have changed greatly over the past 25 years.

CONCLUSIONS: The area of greatest agreement among the respondents in all three groups involves the willingness of the individual to recommend chiropractic as a career to others. Approximately 75% of recent graduates and 80% of 25-year graduates would recommend a career in chiropractic. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Clinical Competencies Assessment Rubric System (C-CARS)

Michael Ciolfi, Canadian Memorial Chiropractic College

BACKGROUND: A rubric is a scoring tool for subjective assessments in order to provide a standardized evaluation according to specified criteria, making grading simpler and more transparent. In a Chiropractic educational clinic setting a properly used rubric will quickly provide the necessary feedback to the intern to successfully close the assessment loop. Critical to this task is a rubric that contains the appropriate assessment criteria linking it to the skills, knowledge and attitude(s) being assessed. Clinicians and interns can then have access to the criteria during pre assessment, assessment and post assessment phases

METHODS: The fourteen CCE clinical competencies (2005) Skills portion and the subsequent subset of skills for each portion served as the performance objective(s) that the rubric was designed around. Each skill was coded numerically starting with History Taking as 001 and each subset of skill, 001–1, 001–2, 001–3 etc. This rubric was then attempted in the chiropractic educational clinic setting for a six month period in the Palmer Florida clinic system.

RESULTS: The feedback from clinicians indicated that although a useful tool, this rubric system was difficult to administer due to the volume of paperwork involved. The interns indicated that they were useful because of the rubric's ability to provide real time formative feedback.

CONCLUSION: The major short coming of C-CARS was the large volume of paper that it produced and the tedious effort required to fill out this paper work. However, C-CARS has the advantage of listing all of the Skills that an intern is expected to know in accordance with the standards indicated by the CCE giving this assessment tool tremendous formative assessment power. If administered in an electronic format, the tedious nature of the paper version would be eliminated making this tool efficient, viable and effective. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Force-Time Profile Characterization of the McTimoney Toggle-Torque-Recoil Technique

Christopher Colloca, Arizona State University, **Christina Cunliffe**, McTimoney College of Chiropractic, **Marisa Pinnock**, Chevington Chiropractic Clinic, **Young-Kwan Kim**, Arizona State University, **Richard Hinrichs**, Arizona State University

INTRODUCTION: Biomechanical investigations to characterize the forces and speeds of chiropractic techniques have been conducted to better understand both the mechanisms and risks of treatment. The purpose of this study was to characterize the force-time profile of the McTimoney Toggle-Torque-Recoil (MTTR) technique.

METHODS: Two licensed doctors of chiropractic with certificated training in the McTimoney Method were given instructions to apply MTTR thrusts as they would normally do in routine clinical practice to a table-top where a dynamic load cell had been mounted. Five thrusts were performed with the right hand and five with the left hand of each clinician in a repeated measures design. Forces were sampled at 5 kHz over a time period of ten seconds using a 16 bit analog-to-digital converter. Peak forces, time durations and time to peak force were computed from each of the force-time histories. Descriptive statistics were calculated on all dependent variables to compare the forces, durations, and times to peak force of the MTTR thrusts. A two-tailed t-test was used to compare variables between the two clinicians.

RESULTS: Considering all MTTR thrusts, the average peak force was 87.22 N (SD=24.18 N), the average overall thrust duration was 36.38 ms (S.D.=9.58 ms), and the average time to peak force was 12.31 ms (S.D.=4.39 ms). No significant differences in mean peak force, duration, or time to peak force were observed between clinicians.

CONCLUSIONS: MTTR thrusts are characterized by a controlled low-force and short duration force-time profile lacking any appreciable preload force. The short duration of MTTR thrusts observed herein are approximately 1.3 times faster than standard Toggle-Recoil techniques and between three and nearly fourteen times faster than other chiropractic adjustment techniques. Further work will investigate the relationship between force-time profiles of MTTR thrusts and the resultant physiologic responses and health benefits from their application. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Interexaminer Reliability of Motion Palpation Using Confidence Calls and Continuous Analysis

Robert Cooperstein, **Michael Haneline**, **Morgan Young**, Palmer Center for Chiropractic Research

INTRODUCTION: Motion palpation (MP) is integral to most chiropractic techniques, and can be found taught within the core curriculum of virtually every chiropractic college. Paradoxically, most studies show MP unreliable. The purpose of this study was to determine if allowing motion palpators to rate their confidence in their findings, as well as a novel analytic method, would influence the level of concordance.

METHODS: Subjects were 52 asymptomatic chiropractic student selected by convenience. Two palpators assessed posterior to anterior glide of T3-10 in the prone position, alternating in their order and blinded as to each other's results. Each examiner identified both the location of maximal restriction in the range, but also noted being either "very confident" or "not confident" in the finding.

RESULTS: For all subjects combined, the examiners' calls correlated weakly ($r = 0.302$, $p = 0.029$) and the corresponding index of agreement was "poor" (ICC [3,1] = 0.302 (95% CI, 0.304 to 0.530)). In contrast, interexaminer agreement was "excellent" when both examiners very confident: $r = 0.862$, $p < 0.000$), as was the index of agreement (ICC [3,1] = 0.827 (95% CI, 0.622 to 0.926)).

DISCUSSION AND CONCLUSION: When each examiner was "very confident" as to the most fixated thoracic segment, the levels they identified were very close. This corresponds to "excellent" agreement, a result not seen to our knowledge in other interexaminer MP studies. Thus, the confidence level of examiners had an effect on the interexaminer reliability of thoracic spine MP, such that agreement was "excellent" when examiners are "very confident" in their calls and not above chance levels when both of them were not. Our novel continuous measures methodology, and defining subgroups according to the confidence of the palpators, seems more sensitive than level-by-level discrete analysis for detecting interexaminer agreement. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Location of the Inferior Angle of the Scapula in Relation to the Spine of a Prone Patient

Robert Cooperstein, **Michael Haneline**, Palmer Center for Chiropractic Research

BACKGROUND: Previous studies established the mean location of the upright inferior angle of the scapula angle (IAS) to be near the spinous process (SP) of T8, although numerous sources claim it near the SP of T7. The current study investigates whether the prone IAS lines up with the T6 SP, as chiropractors commonly believe; and the direction of movement compared with the upright position.

METHODS: The location of the IAS in relation to the spine of 20 mostly asymptomatic subjects with pain-free shoulder ranges of motion was assessed on a Hi-Lo table (2 standing, 5 prone positions) with the arms in each of 7 different postures. To obtain these measurements, we marked lines on each of the examiner's thumbnails and measured the axial displacement of the thumb contacting the IAS and the nearest SP. The palpator firmly held his thumb on the SP identified in the first upright measurement for each of the remaining 6 measurements.

RESULTS: The scapula moved cephalad relative to the upright, arms dangling position in two of the test positions: prone, arms at side (10.4 mm); and prone, chicken-wing (18.7 mm. It moved caudad in the other 4 test positions: upright, handlebars (12.5 mm), prone, armrest (18.4), prone dangling (15.5 mm), and prone, above head (12.8 mm).

CONCLUSIONS: In the most common position, prone with hands on armrest, the IAS moves caudad about one vertebral level, not cephalad as is commonly believed. Attempting to locate an x-ray level on a prone patient using typical upright and prone scapular landmark rules misses by 3 levels due to landmark error, and possibly by more factoring in patient variation and examiner palpatory error. Such misses suggest chiropractic and other manual interventions may be less specific than intended. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Chiropractic Management of Carpal Tunnel Syndrome Complicated with Intra-Osseous Ganglion Cysts: A Case Report

Glenn Crafts, **Kim Hong Vo**, **Kim Hong Ngoc Vo**, **Gregory Snow**, Palmer College of Chiropractic West

OBJECTIVE: To present a case of carpal tunnel syndrome (CTS) with ganglion cysts that was conservatively managed with chiropractic care resulting in subjective and objective improvement of associated symptoms.

CASE PRESENTATION: A 47 year old right handed female suffered an industrial injury to both wrists subsequent to a repetitive stress injury. Symptoms consisted of bilateral wrist pain, paresthesias and weakness. Previous courses of conservative management failed to improve the clinical picture. Radiographs were unremarkable; however, MRI revealed intraosseous ganglia involving both wrists. Electrodiagnostic studies indicated mild left CTS.

INTERVENTION AND OUTCOME: Chiropractic manipulation of the carpal bones and elbow joint, myofascial release techniques and physiotherapy modalities were applied for this case. Physiotherapy modalities consisted of electrical muscle stimulation, ultrasound, moist heat or cryotherapy and stretching and strengthening to facilitate and expedite the soft tissue healing process. Proprioceptive neuromuscular facilitation techniques were found useful with the forearm flexors and extensors. Home care consisted of stretching exercises and strengthening exercises for the forearm musculature utilizing elastic tubing and a gyroscopic manual hand held device. At the conclusion of care, subjective complaints of hand paresthesias and muscle weakness were reported by the patient to be improved with respect to intensity and frequency. Objectively, the patient demonstrated improved range of motion in both wrists and improved forearm flexor and extensor strength.

CONCLUSION: This case demonstrates successful management of mild CTS complicated by ganglion cysts with conservative methods. Additional research, including case studies and preferably large scale studies, would be beneficial in determining the efficacy of chiropractic management of this condition. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Safety Incidents, Treating Complications and Reactions Recorded in a Student Teaching Clinic. A Retrospective Analysis

Christina Cunliffe, McTimoney College of Chiropractic, **Ian Johnson**, McTimoney College of Chiropractic, **Jennifer Selby**, Private Practice

INTRODUCTION: Recording and analyzing information on patient safety incidents (PSIs) and side effects of treatment is an essential part of risk management in any healthcare profession. This study has looks at PSIs, and side effects of treatment in a chiropractic student teaching clinic.

METHODS: A Patient Conditions Treatment Reactions and Incidents (PCTRI) reporting form was developed and used to undertake a retrospective review of 931 new patient records over a 20 week period in 2006.

RESULTS: An incident rate of 0.6% per treatment or patient contact was recorded. All negative reactions to treatment and PSIs fell in to the "no harm" or "low harm" categories. Interestingly, 35.5% of PSIs were related to the initial assessment where no treatment was given. A positive link was found between the number of treatments and the likelihood of experiencing a PSI. Most common negative reactions to treatment were local discomfort (55.5%) tiredness (22.86%) and headache (7.29%). Most reports of negative reactions (85%) were from females.

CONCLUSION: The PCTRI data for new patients in 2006 indicate that PSIs have a very low incidence and that they are of little or no harm to the patient. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Measuring the Quality of Patient Satisfaction Data: Examination of Multi-Modal Data Collection

Dustin Derby, **Andrea Haan**, **Kurt Wood**, Palmer College of Chiropractic

INTRODUCTION: The role of patient satisfaction is paramount to maintaining high clinical quality assurance. Collection of survey data presents definite challenges within clinical settings. A better understanding of the effectiveness of multimodal data collections in clinical settings will inform quality assurance efforts. The purpose of this study was to investigate the response rates, response bias, and the completeness of data between paper and electronic modes of a chiropractic patient satisfaction survey.

METHODS: Convenience samples of 207 chiropractic college clinic patients were surveyed concerning their satisfaction with chiropractic care. Three modes of survey administration (in clinic paper, take home paper, in clinic online) were evaluated for response rates, response bias, and omission errors via descriptive and regression statistics.

RESULTS: Analysis indicated the in clinic paper and in clinic online modes exhibited comparable response rates. The in clinic paper mode displayed the greatest number of form and total omission errors, whereas the in clinic online mode presented the lowest number of item, form, and total omission errors. Significant predictive relationships were found for the postal paper mode concerning both omission errors and response bias for gender and age.

DISCUSSION: Prior research supports findings from the current study. Unexpected findings from this study, not supported in prior empirical research, were the response bias of men and older patients indicated for the postal paper mode.

CONCLUSION: Accurate and complete information regarding patient satisfaction is essential to improving the quality of patient care. The results of the current study suggest that when measuring patient satisfaction in a college clinic setting, online data collection may be most effective. This mode resulted in data of higher quality with regard to completeness of information and lacked evidence of response bias or prediction of error when compared to in clinic paper or postal paper modes. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Using the Appreciative Inquiry Model to Develop a Curriculum in Evidence-Informed Practice

Renee DeVries, Northwestern Health Sciences University, **Michele Maiers**, Northwestern Health Sciences University, **Louise Delagran**, University of Minnesota, **Roni Evans**, Northwestern Health Sciences University

INTRODUCTION: As utilization of complementary and alternative medicine (CAM) continues to grow, and CAM practitioners participate in more integrated health care settings, it is imperative that these providers are prepared to participate in evidence-informed practice (EIP). As such, it is incumbent upon institutions of complementary and alternative medicine to model EIP and to incorporate EIP principles throughout the curriculum. The Northwestern

Health Sciences University (NWHSU) Complementary and Alternative Medicine (CAM) Research Education Project is a program designed to increase the use of evidence-informed practice (EIP) by CAM providers. The program involves curriculum development for students, teaching faculty, and clinicians. The purpose of the study was to gather information regarding the perceptions of faculty to EIP and research related competencies.

METHODS: A survey to elicit level of agreement with the competencies was administered to faculty at a campus-wide faculty development day.

RESULTS: Fifty-three faculty participated in the survey. The responses indicated overwhelming agreement with all of the competencies.

DISCUSSION: Appreciative inquiry is a model of change that approaches change through an exploration of possibilities and an accentuation of current strengths. The survey served the main purpose of gathering feedback on the competencies but it also served to engage the faculty and involve them in the process of curricular change.

CONCLUSION: The appreciative inquiry model creates a framework for positive organizational change through methods that engage and empower participants. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Relationship between Posttraumatic Stress Disorder and Clinical Outcomes within a Veterans Affairs Medical Center Chiropractic Clinic

Andrew Dunn, VA of Western New York & New York Chiropractic College, **Steven Passmore**, New York Chiropractic College, **Jeanmarie Burke**, New York Chiropractic College, **David Chicoine**, New York Chiropractic College

INTRODUCTION: The primary purpose of this study was to evaluate clinical outcomes for veteran patients with either neck or low back pain completing a course of care within the chiropractic clinic at the VA of Western New York Healthcare System in 2006. The secondary purpose was to investigate potential relationships between clinical outcomes and patient age, Body Mass Index, Service Connected (SC) disability percentage, SC disability percentage related to the musculoskeletal system, baseline outcome measures, number of treatments, and posttraumatic stress disorder (PTSD) diagnosis.

METHODS: Retrospective chart review for 130 veteran patients with completed outcomes and a minimum of four treatments for either neck or low back complaints. Measures included the Revised Oswestry Disability Questionnaire and the Neck Disability Index.

RESULTS: Including management for both neck and low back complaints, there was a statistically significant difference of 8.05 ± 10.47 points between the mean baseline score of 47.61 ± 16.59 and the mean discharge score of 39.56 ± 17.97 ($t=8.768$, $p < 0.001$) representing a mean percentage improvement of $17.7\% \pm 27.13$. There was a statistically significant association between baseline outcome scores and score improvement ($r=0.178$, $p < 0.05$). Veteran patients with PTSD ($n=21$) experienced markedly lower levels of improvement than those without PTSD. In veteran patients with <50% SC disability and without PTSD ($n=86$), there was a statistically significant mean score improvement of 9.91 ± 9.97 ($t=9.21$, $p < 0.001$).

DISCUSSION: The study demonstrated that chiropractic management for neck and low back pain was an effective treatment intervention for this sample of veteran patients without PTSD and with <50% SC disability. Similar to the general population, severe psychosocial factors decreased the likelihood of obtaining positive clinical outcomes with chiropractic management. Additional collaborative research is warranted to further explore the contributions of PTSD and SC disability on chiropractic outcomes within this unique patient population. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Effects of Manipulation on Eccentric and Concentric Motion of the Ilium around the Sacrum

Dennis Enix, **Kristan Giggey**, **Adrian Raphael**, Logan University

INTRODUCTION: The Sacroiliac (SI) joint is a diarthrodial joint with the contradictory biomechanical function of transmitting compressive loads from the lumbar spine to the lower extremity while maintaining a nutating motion in the pelvis. Significant correlations exist between static pelvic asymmetry and the resultant asymmetric trunk motion that accompanies gait, postural control and low back pain. Few studies have examined the effects of manipulation on the functional biomechanics of the ilium in relation to the sacrum.

OBJECTIVE: To examine whether manipulation of the pelvis affects eccentric and concentric motion of the ilium around the sacrum.

METHODS: Sacroiliac joint motion was assessed during the normal gait cycle with the Polhemus Liberty motion capture system. Sensors attached to left and right anterior superior iliac spines recorded motion characteristics of the pelvis at a sampling rate of 60 frames per second pre and post manipulation. A convenience sample of twenty healthy subjects (11 males & 9 females), mean age 22.65 ± 3.08, without acute low back injury or sacroiliac joint pathology, gave informed consent and participated in this study.

RESULTS: Analysis of motion capture Euler angle data revealed statistically significant increases ($p < .05$) in angular deviation along the Y axis in a 3 dimensional coordinate system between pre therapy (PT1) and post therapy (PT2) groups 67.5% of the time; PT1= 5.882 ± 2.111, PT2= 6.910 ± 2.231, (p= 0.000188). The right PT2 group increased angular movement 65% of the time compared to 32.5% on the left. The combined male PT2 group increased 65 % of the time; PT1= 6.0862 ± 2.6127, PT2= 6.9903 ± 2.5356, (p= 0.0216). The combined female PT2 group increased 32.5 %; PT1= 5.6329 ± 1.2919, PT2= 6.8124 ± 1.8601, (p= 0.0028).

CONCLUSIONS: These findings indicate that manipulation increases SI Joint functional mobility in subjects without acute SI joint pathology. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Effects of Neuromuscular Training on Core Stability

Dennis Enix, **Michael Vianin**, **David Beavers**, **Rodger Tepe**, Logan University

INTRODUCTION: Low back pain (LBP) is rarely explained by a single structural pathology and is more likely from accumulated biomechanical and pain-related psychological variables. Rehabilitation protocols for LBP commonly include proprioceptive and neuromuscular training which have clinically encouraging results, but modest empirical support. Reactive neuromuscular training (RNT) is one form of therapy that is promising, yet has not been fully investigated.

METHODS: Hold times on the McGill side bridge endurance test were measured bilaterally on a group of 28 participants before and after three weeks of RNT. RNT using the SpineForce machine was used as the intervention.

RESULTS: Holding times measured in seconds increased after RNT. The mean $\pm$ one standard deviation (2-tailed t-test) pre-training left side hold time was 63.61 ± 29.56 ($t = 11.38$, $p = 0.000$) and pre-training right side hold time was 68.50 ± 37.14 ($t = 9.76$, $p = 0.000$). After intervention, post-training left side hold time side was 73.39 ± 36.84 ($t = 10.54$, $p = 0.000$) and post-training right hold time was 81.89 ± 50.63 ($t = 8.56$, $p = 0.000$). For females, left pre-training hold time was 47.78 ± 19.90 and post-training hold time was 62.00 ± 32.50 (pre-post $p = 0.063$), while right pre-training hold time was 47.33 ± 27.92 and post-training hold time was 57.56 ± 30.33 (pre-post $p = 0.001$). For males, left pre-training hold time was 71.11 ± 31.36 and post-training hold time was 78.79 ± 38.35 (pre-post $p = 0.000$), while right pre-training hold time was 78.53 ± 37.31 and post-training hold time was 93.42 ± 54.80 (pre-post $p = 0.004$).

CONCLUSIONS: RNT aids development of muscle endurance important for spinal stabilization. In this study RNT increased core muscle endurance and therefore has the potential to be a useful rehabilitation tool in prevention and treatment of LBP. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Regeneration of the Intervertebral Disc: Is the Notochord the Holy Grail?

William Mark Erwin, University of Toronto, Toronto Western Hospital, Canadian Memorial Chiropractic College

INTRODUCTION: Degenerative disc disease (DDD) is an extremely common and expensive healthcare ailment which unlike advances in biologic therapies for fracture management and disease modifying drugs for various arthropathies has no curative strategy which attenuates or reverses the degenerative cascade. There is a naturally occurring sub-species of canine that is protected from developing DDD, the non-chondrodystrophic (NCD) dog. NCD canines also maintain large populations of notochord cells within their intervertebral discs for many years. Here we identify an anabolic growth factor "Connective Tissue Growth Factor" (CTGF/CCN2) contained within conditioned medium obtained from canine notochordal cells.

METHODS: NCD notochordal cells were cultured within alginate beads in serum-deficient conditions (DMEM) to produce notochord cell conditioned medium (NCCM). NCCM was evaluated using LC-MS/MS mass spectroscopy and anabolic candidates were further confirmed using immunoblotting procedures.

RESULTS: NCCM was found to contain connective tissue growth factor precursor (CTGF/CCN-2). Western blotting confirmed the presence of CTGF/N-2 within notochordal cell lysates (Figure 1). The addition of human recombinant CTGF/CCN2 (rhCTGF) robustly increased aggrecan gene expression in bovine NP cells at a similar level to between 100 and 200 ng/mL rCTGF.

DISCUSSION: This is the first demonstration that disc notochord cells secrete CTGF/CCN2-a recently discovered multifunctional growth factor known to induce proteoglycan and collagen production, cell proliferation and differentiation in chondrocytes. It is now widely accepted that CTGF/CCN-2 exerts important homeostatic control of connective tissues by virtue of its ability to mediate extracellular matrix processes. CTGF/CCN-2 proteins modulate mitosis, cellular migration, binding of other growth factors, wound healing and have varying influence concerning either pro- or anti-apoptotic signaling depending upon the cells and tissues involved. CTGF/CCN2 has recently been identified within the developing notochord and is likely a hitherto unrecognized but important developmentally-related molecule that could confer important matrix protective signaling within the notochordal cell-rich nucleus pulposus. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Sacroiliac Orthopedic Blocking Improves Cervical Spine Extensor Isometric Strength

Kristan Giggey, **Rodger Tepe**, Logan University, College of Chiropractic

PURPOSE: Reviews of the effects of chiropractic manipulative therapy on head and neck conditions are equivocal. The spine is a kinematic chain subject to reflexive muscle responses induced by the stimulation of muscle and joint afferents. The purpose is to determine if an orthopedic blocking procedure may be a useful adjunctive treatment for cervical spine dysfunction.

METHODS: Following written informed consent, 22 participants with a measured leg length inequality of 5 mm or more were sequentially assigned into treatment and control groups. Treatment consisted of a 2 minute procedure using orthopedic blocks (padded wedges with a 45 degree incline) which were placed bilaterally under the ilia as determined by leg length assessment. Isometric strength measurements took place in two sessions with a day of rest between. The treatment group received therapy at the second session immediate to post isometric measures.

RESULTS: Outcome measures were the pre & post measurements of cervical isometric extension strength in pounds. T-tests showed no statistically significant difference between groups in isometric extension strength prior to treatment. One-way ANOVA demonstrated a significant difference between groups following treatment, $F(1, 21) = 7.174$; $p = .014$. The treatment group demonstrated an average increase of 6.35 (8.18) lbs in extensor strength.

CONCLUSIONS: The current study showed a statistically significant change in cervical isometric extensor strength following SIJ manipulation. Orthopedic blocking may be a useful adjunctive treatment for cervical spine dysfunction. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Effects of Increasing Core Muscle Strength and Endurance in Participants with Chronic Low Back Pain

Kristan Giggey, **Peter Thomas**, **Rodger Tepe**, Logan University, College of Chiropractic

BACKGROUND: Lumbar spinal stability is important for the prevention of spinal degeneration and injury. The core muscles function to stabilize the lumbar spine and their dysfunction has been demonstrated in populations with low back pain. In particular the transverse abdominis and quadratus lumborum, have been shown to be weakened in patients with chronic low back pain. Low back pain has a prevalence of approximately 18% with associated costs of an estimated $15–50 billion.

METHODS: The study was conducted at a midwestern university. Written informed consent was obtained. Participants were students with ages ranging between 20 and 30. All participants had persistent low back pain with a minimum of 3 months duration. Inclusion criteria included an Oswestry percent disability score of 20% or greater. All subjects were assigned to a single group. Participants were assessed pre and post with the timed Side Bridged Endurance Screening. Treatment consisted of supervised core strengthening exercises.

RESULTS: There was a significant difference in pre and post Oswestry percent disability scores. Post treatment sidebridge scores increased but were not determined to be significant.

CONCLUSION: The application of a four-week general strength and endurance-training program for core muscles significantly decreased low back pain and disability in chronic low back pain patients. Results did not indicate a statistically significant improvement in Side Bridged Endurance. However many of the participants did show clinical improvement suggesting clinically significant results. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Effects of Trunk Muscle Fatigue and Load Timing on Spinal Responses during Sudden Hand Loading

Diane Grondin, Canadian Memorial Chiropractic College & University of Windsor, **Jim Potvin**, University of Windsor & McMaster University

PURPOSE: To investigate the responses of the spine during sudden loading in the presence of back and abdominal muscle fatigue, with a primary focus on the implications for spinal stability.

METHODS: Fifteen females were studied and each received sudden loads to the hands, at both known and unknown times. Participants received these loading trials (a) while rested, (b) with back muscle fatigue, and (c) with a combination of back and abdominal muscle fatigue. Measures were taken on the EMG activity of two trunk extensor and two abdominal muscles, and on the trunk angle and centre of pressure. A 3×2 Repeated Measures ANOVA was performed. There were no preparations made prior to the perturbation even when it could be anticipated.

RESULTS: The peak responses that followed were greater in the unexpected versus the expected condition. In addition, trunk muscle fatigue led to an increase in the baseline activity of the trunk muscles but no additional increase in activity just prior to loading. There was increased activation of both (opposing) muscle groups when only one muscle group was fatigued.

DISCUSSION: Because the peak responses following the perturbation were enhanced in the unknown timing condition, preparations must have taken place prior to the anticipated perturbations, perhaps in other segments of the body that were not measured. Also, the load impact may not have been great enough to elicit large preparations. The heightened baseline activity with fatigue suggests that there may have been increased spinal stiffness whenever the spine was fatigued, and not just immediately prior to an impending perturbation. The increased activation of opposing muscle groups is evidence of increased co-contraction in response to fatigue, possibly to maintain stability with decreasing coordination.

CONCLUSION: The findings of this study can aid in determining the cause of injury and reducing injury risk in chiropractic patients and practitioners who handle shifting weight. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Intraexaminer and Interexaminer Reliability of Static Spinal Palpation

Michael Haneline, **Morgan Young**, Palmer Center for Chiropracitc Research, Palmer College of Chiropractic

BACKGROUND: A number of studies have evaluated the reliability of static spinal palpation, generally founding it to be low. Several reviews have highlighted these findings, although palpation of tender or painful segments was reported to be the most reliable form of static palpation.

PURPOSE: To locate studies that assessed the reliability of static palpation of the spine and sacroiliac joints, to appraise the quality of these studies, and synthesize their results.

METHODS: A search was conducted of chiropractic and medical databases for the years 1965 through October 2007. The reference sections of the included articles were inspected for additional citations. Only peer-reviewed articles in the English language that contained information about static palpation of the spine or sacroiliac regions were selected. The resulting studies were appraised for quality by two of the authors using an instrument that was specifically developed to assess the quality of reproducibility studies.

RESULTS: The search generated 343 citations and another 7 were harvested from the reference lists. After removing articles that did not meet the inclusion criteria, 29 articles were retained. Fourteen studies focused on the assessment of the reliability of locating painful or tender points, 10 focused on the location of landmarks, and 5 focused on position or alignment of bone structure. A higher proportion of the studies that assessed the location of painful or tender points reported acceptable levels of reliability. However, based on method of palpation, there were no statistically significant differences when comparing the proportions of high-quality studies that reported good reliability. Thus, no form of static palpation could be considered to be superior.

DISCUSSION: The included studies generally reported indices of agreement that were low. More of the pain palpation studies reported acceptable kappa levels, although no one method of palpation could be deemed clearly superior to the others. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

A Photographic Evaluation of Sacroiliac Motion at Varying Angles of Leg Flexion During The Step Test

Michael Haneline, **Robert Cooperstein**, **Morgan Young**, Palmer Center for Chiropracitc Research, Palmer College of Chiropractic

BACKGROUND: The "step test" (Gillet test) is commonly used to assess motion in the sacroiliac (SI) joints. Reports of the test's reliability have been at odds, generally pointing to it only being slight. The test's validity has not been adequately investigated, although a few studies have reported it as being unacceptable. The direction and amount of motion that occurs in the SI joints has been explored in several studies, although their findings have been somewhat in conflict

PURPOSE: The purpose of this study was to develop a method of observing the degree and direction of SI motion as measured on photographs taken during the step test and to observe if there was a difference in SI motion when measured with the patients' legs at 60 versus 90 degrees.

METHODS: Marks were applied to the skin over the second sacral tubercle as well as on each of the examiner's thumbnails. The examiner then grasped each subject's bilateral ilia with both hands, while firmly contacting the posterior superior iliac spines (PSIS) with the thumbs. Subjects were asked to slowly lift their legs one at a time, flexing the hip to 60 and 90 degrees. Photographs were taken with subjects in each of the previously mentioned positions, including views with both feet on the floor.

RESULTS: With the left leg raised, the PSIS moved in a caudad direction with respect to the sacrum in four out of six subjects at 60 degrees and three out of six subjects at 90 degrees, with one subject exhibiting no detectable change at 90 degrees.

CONCLUSION: We consider this method of observing SI joint motion feasible and, as expected, observed changes between the marks on PSIS and S2 as the ilium rotated with respect to the sacrum. Most subjects in our study exhibited caudad movement of the PSIS. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Runners use of Chiropractic and Complementary and Alternative Medicine: A Retrospective Survey among Marathon Runners in the United Kingdom

Sheena Harding, **Gay Swait**, **Ian Johnson**, **Christina Cunliffe**, McTimoney College of Chiropractic

PURPOSE: This study investigated utilization and perceived effectiveness of chiropractic and CAM in non-elite marathon runners in the UK, aiming to enhance understanding of healthcare and treatment preferences in this sub-group. An additional aim was to generate preliminary data on modalities chosen to treat specific running injuries.

METHODS: A retrospective, descriptive non-experimental survey distributed to a sample of non-elite runners participating in the 2007 Flora London Marathon

RESULTS: 99 completed questionnaires were analyzed (response rate = 99%). 43% of participants had sustained running-related injuries in the past year. Knee/lower leg (48%) and back (21%) conditions were most prevalent. 37% used CAM or non-CAM modalities alongside orthodox medical care by their GP, while a further 37% used these without consulting their GP. CAM utilization was 21% in both genders, with chiropractic (11%), massage (12%) and acupuncture (9%) being most utilized, particularly for back/low back pain, knee/ankle and lower limb soft tissue injuries. Of non-CAM modalities, physiotherapy (44%) was most prevalent. 76% of users recommended treatments to friends/family, and 84% would like to see CAM available on the NHS. The majority perceived chiropractic and CAM as beneficial and reasonable cost.

CONCLUSION: Runners used chiropractic and CAM for treatment of specific running injuries, as well as for injury prevention and to enhance general well-being. Utilization levels appeared higher than those reported for the general population. There was a high level of satisfaction with CAM. Further clinical research should investigate efficacy of chiropractic and CAM modalities for treatment of specific running-related injuries. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Normative Cross-Sectional Area of the Brachial Plexus and Subclavian Artery Using Ultrasonography

Daniel Haun, **Norman Kettner**, **Thomas Clark**, Logan College of Chiropractic

INTRODUCTION: The cross-sectional area (CSA) of the brachial plexus at different locations of the thoracic outlet has not previously been reported using ultrasonography. The subclavian artery has been studied with ultrasonography in relation to thoracic outlet syndrome, but a normal range for the CSA has not been described in the literature.

OBJECTIVE: Establish a normal range of values for the CSA of the brachial plexus, subclavian artery, axillary artery, and peak systolic velocity of the subclavian artery and axillary artery in normal subjects using ultrasonography.

METHODS: Thirty-two asymptomatic subjects (19 male, 13 female) with an average age of 29.5 +/− 9.6 years old, participated in the study. The brachial plexus and subclavian artery CSA were measured at three locations: interscalene, 1st rib, and infraclavicular. The peak systolic velocity of the subclavian artery was measured in both supraclavicular and infraclavicular locations. All measurements were performed with the subjects in the supine position and the arm fully abducted. Each subject was imaged bilaterally, for a total of 64 sets of measures.

RESULTS: The average CSA for the brachial plexus at the interscalene space, first rib, and infraclavicular location was 0.75+/−0.16 cm2 (0.43–1.09 cm2), 0.96+/−0.21 cm2 (0.54–1.38 cm2), and 0.98+/−0.21 cm2 (0.56–1.40 cm2), respectively. The average CSA for the subclavian artery at the interscalene space, first rib, and infraclavicular location was 0.35+/−0.09 cm2 (0.17–0.53 cm2), 0.38+/−0.09 cm2 (0.20–0.56 cm2), 0.35+/−0.09 cm2 (0.17–0.53 cm2), respectively. The average subclavian artery peak systolic velocity in supraclavicular and infraclavicular locations was 99+/−23 cm/s (53–145 cm/s)and 92+/−20 cm/s (52–132 cm/s), respectively.

CONCLUSIONS: This is the first study to obtain normative CSA measurements of the brachial plexus and subclavian artery in multiple locations of the thoracic outlet. This data may be beneficial in future studies designed to assess the brachial plexus and subclavian artery in symptomatic subjects with thoracic outlet syndrome. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Move Muscles to Know Muscle Movement - An Innovative Teaching Method for Skeletal Musculature Anatomy

Xiaohua He, **Niu Zhang**, **James La Rose**, Palmer College of Chiropractic Florida

INTRODUCTION: In the teaching of anatomy, one of the difficulties for students has been the understanding of skeletal musculature anatomy. Therefore, teaching effectiveness of skeletal musculature anatomy has become an imperative issue. An innovative teaching way, called "two-dimension (2-D)/three-dimension (3-D) muscle placement", to enhance the teaching effectiveness was developed. It has subsequently been evaluated by control and cross-over methods, including written tests, lab practical and questionnaire survey.

METHODS: 2-D outlines of important upper and lower extremity muscles were made on A4 papers, and cut out. Participants were given the chance to paste these 2-D muscle outlines on adult skeletons based upon their understanding of the origins and insertions. The assessments were made by measuring and comparing the results of pre- and post written tests and a lab practical between participants and nonparticipants. A comparison among participating students was also made between pre- and post-tests. Meanwhile, a survey questionnaire was also given to the participating students.

RESULTS: The participants showed no difference of the scores on the pre-test compared to the nonparticipants ($p > 0.05$). However, participants scored significantly better than the nonparticipants students on the post-test and lab practical ($p < 0.001$). The comparison study also revealed that participants scored significant higher on the post-test than the pre-test ($p < 0.001$). Furthermore, participants overwhelmingly responded in a strongly positive manner that the 2-D/3-D muscle placement method was very effective in helping them to learn skeletal muscle anatomy.

DISCUSSION: The 2-D/3-D muscle placement method is a low-cost and efficient way of teaching skeletal musculature anatomy. The reasons for those participants who performed better on both written and lab tests could have been a direct result of using the 2-D/3-D muscle placement method as it positively affected student comprehension, retention of the knowledge and their ability to use this information to solve problems. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Construct Validity of Prognostic Factors Related to Individuals with Low Back Pain Who May Improve with Spinal Stabilization Exercises

Jeffrey Hebert, University of Utah, **Shane Koppenhaver**, University of Utah, **Julie Fritz**, University of Utah, **Jake Magel**, Intermountain Healthcare

INTRODUCTION: Prognostic factors have been identified which predict the clinical response to spinal stabilization exercise among individuals with low back pain (LBP). Deficits of the lumbar multifidus (LM) and transversus abdominus (TrA) muscles have also been observed in individuals with LBP, however the relationship between these deficits and the prognostic factors has not been explored. The purpose of this study was to examine the construct validity of prognostic factors purported to predict a favorable clinical outcome with stabilization exercise by evaluating the relationship between these factors and the degree of TrA and LM muscle activation.

METHODS: Forty-five volunteers with LBP were evaluated for the presence of prognostic factors (positive prone instability test (PIT), age less than 40 years, aberrant movements, straight leg raise greater than 91°, and the presence of lumbar hypermobility) and degree of TrA and LM muscle activation during submaximal tasks using rehabilitative ultrasound imaging. We examined the relationship between the prognostic factors, individually and as a group, and LM and TrA muscle activation using point-biserial or Pearson correlation coefficients.

RESULTS: Significant relationships were identified between LM muscle activation and the number of prognostic factors identified; $r = -0.45$, $p < 0.01$, as well as the individual factors of segmental hypermobility; $r = 0.34$, $p = 0.01$, and a positive PIT; $r = 0.29$, $p = 0.03$. No significant correlations were observed for any factor or combination of factors and TrA muscle activation.

CONCLUSIONS: Patients demonstrating lumbar hypermobility, a positive PIT, or who met a greater number of stabilization criteria were more likely to have lower LM activation when compared to subjects without these characteristics. There were no significant correlations relating any of the factors to TrA activation. These findings support the construct validity of the stabilization CPR as being related to activation of the LM, but not the TrA. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Comparison of Hybrid Online Format and Traditional Classroom Format in a Chiropractic Methods Course

Glori Hinck, **J. R. Hulbert**, **Thomas Bergmann**, Northwestern Health Sciences University

INTRODUCTION: Online delivery of course content has frequently been found to result in equivalent or superior learning outcomes. This study investigated the efficacy of a hybrid asynchronous course in the chiropractic college setting by comparing pre- and post- online delivery examination scores.

METHODS: Mean examination scores were used to compare the effectiveness of online teaching in a chiropractic methods course to the traditional lecture format. A second comparison examined the effect of a concurrent course. The sample sizes involved between 65 and 130 students. The same core content was taught and equivalent examinations were used. Approval for the study was granted by NWHSU IRB.

RESULTS: Independent group mean comparisons, using midterm and final course exams, were performed. Comparisions were made of scores from the last "traditional" method trimester (n=77) and the first trimester using the online method (n=115). The primary comparison of final exam data from the previous six "traditional" method trimesters (n=539) were compared to the final exam scores from the single "online" timester (n=115). The result of this comparison was t= 1.09, df=650, p=0.28. Results indicated that student achievement, for both "traditional" and "online" courses, was equivalent.

DISCUSSION: An online multimedia format allows learning to take place at locations and times more convenient to the student, allows the student to revisit information as many times as they choose, and supports active learning potentially improving learning outcomes. Even with the potential biases against online learning in this study design, our results still suggest that no significant difference exists between online delivery and the traditional lecture format for this course. In fact, the effects of a concurrent course are found to potentially be more significant than delivery methods.

CONCLUSION: The evidence supports our alternative hypothesis that online course delivery can be an effective method of teaching in the chiropractic setting. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Interexaminer Reliability of a Leg Length Analysis Procedure

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PURPOSE: To establish the interexaminer reliability of a leg length analysis protocol between an experienced chiropractor and an inexperienced chiropractic student who has undergone an intensive training program.

METHODS: 50 participants, aged from 18–55 years, were recruited from the New Zealand College of Chiropractic teaching clinic. An experienced chiropractor and a final year chiropractic student were the examiners. Participants were examined for leg length inequality in the prone straight leg and flexed knee positions by each of the examiners. The examiners were asked to record which leg appeared shorter in each position. Examiners were blinded to each other's findings. Kappa statistics and percent agreement between examiners were used to assess interexaminer reliability. The study was approved by the New Zealand Ministry of Health Northern X Regional Ethics Committee and was conducted in accordance with the Declaration of Helsinki.

RESULTS: Kappa analysis revealed substantial interexaminer reliability in both leg positions and also substantial agreement when straight and flexed knee results were combined for each participant. Kappa scores ranged from K = 0.61, with 72% agreement, for the combined positions to K = 0.70, with 87% agreement, for the extended knee position. All of the kappa statistics analysed surpassed the minimal acceptable standard of 0.40 for a reliability trial such as this.

CONCLUSION: This study revealed substantial interexaminer reliability of all aspects of the leg length analysis protocol utilized in this study. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Biomechanical Role of Annular Fiber Orientation Angle under Compression and Distraction Loadings: A Finite Element Model Study

Mozammil Hussain, **Rodger Tepe**, Logan College of Chiropractic

INTRODUCTION: The orientation angles of annular fibers play a major role in determining bulging behavior and mechanical strength of the disc. These fibers exhibit a wide range of anisotropy within the disc, and reorient toward loading direction. Chiropractic spinal manipulative therapy is load-direction dependent in its affects on disc and fiber mechanics. Existing literature supports the biomechanical significance of annular fibers in governing disc biomechanics under different combinations of loading conditions. However, the changes in segmental mechanics accompanied by changes in fiber angles when the loading mode is changed from compression to distraction have not been reported.

OBJECTIVE: A computational model comparing the segmental biomechanical responses under compression and distraction loads when the orientation angle of annular fibers was varied.

METHODS: A previously validated three-dimensional finite element model of a cervical motion segment was used that consisted of six concentric lamellae from annular fibers. Each lamella was modeled with fibers oriented at an equal and an opposite angle to the transverse plane. Five different models were developed corresponding to five different fiber angles: $\pm 25^\circ$, $\pm 35^\circ$, $\pm 45^\circ$, $\pm 55^\circ$, and $\pm 65^\circ$. The models were analyzed in compression and distraction loadings.

RESULTS: Increasing fiber angle showed no biomechanical effects on the segmental stiffness and stresses in the cortical and cancellous bones. However, fiber stress in each lamella, stresses in annulus and nucleus, and endplate stress decreased. Also, bulging in annulus increased, whereas nucleus bulging decreased. When the loading mode was changed from compression to distraction, tensile stresses in the fibers decreased and disc bulging was negligible. Further, segmental stiffness and stresses in cortical bone, cancellous bone, endplate, annulus, and nucleus changed from compressive to tensile. Outer fiber lamellae were more stressed than inner fiber lamellae.

CONCLUSION: The variation in annular fiber angles affects disc and fiber mechanics in distraction differently than in compression. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Nine Year Longitudinal Retrospective Study of Taekwondo Injuries

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BACKGROUND: This study compared colored versus black belt Taekwondo athletes with regard to type, location, and mechanism of injury sustained over 9 years of competition. This study is unique in encompassing over 9 years of data looking at relationship between experience level and above variables. We also examined whether recent rule changes concerning increased point value of head shots in adult Taekwondo competition has affected injury rates.

METHODS: This retrospective study examined 904 injuries in male and female athletes of all experience levels and ages competing in 58 provincial level tournaments over nine years. An injury form served to document nature, site, severity, and mechanism of injury, as well as treatment provided by the healthcare team. These injury reports were required by provincial laws and later were used as data set.

RESULTS: The three most common locations of injury were the head (19%), foot (16%), and thigh (9%). The most common mechanism of injury was found to be a defensive kick (44%), followed by an offensive kick (35%). The most commonly diagnosed injuries were contusions (36%), sprains (19%), and strains (15%). Males received three times as many head injuries as females. Colored belt competitors had a higher incidence of contusions, while black belt competitors sustained more lower limb injuries than head injuries. We found no significant difference in location or type of injury when comparing pre versus post rule change.

CONCLUSIONS: The most common locations of injury are head, foot, and thigh respectively. Head and lower extremity injuries are areas for concern when considering preventative measures. Color belt competitors are more likely to sustain contusions, possibly due to more aggressive tactics and lack of control. Those more likely to be injured tend to be male, and younger than 18 years. Recent rule changes have no significant effect on head injuries. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Cortical Processing of Acupuncture Sensations

Norman Kettner, Logan College of Chiropractic, **Vitaly Napadow**, Massachusetts General Hospital & Logan College of Chiropractic, **Jiuen Kim**, Massachusetts General Hospital, **Polly Dhond**, Massachusetts General Hospital, **Lauren Lacount**, Massachusetts General Hospital

BACKGROUND: Sensations induced by acupuncture may be related to clinical efficacy. The fMRI block design is used to study the CNS correlates of acupuncture; its sensations may not be confined to the block partitions.

METHODS: 15 healthy subjects were stimulated at acupoint left PC-6, while rating their sensation with an MR-compatible rotary knob potentiometer in the opposite hand. Output feedback was presented visually allowing continuous rating. A 30 sec ON-OFF block design was used for 5.5 min. Verum acupuncture (VA) was delivered by twisting ($\sim$1 Hz) a non-magnetic, silver needle. Sham (SA) was delivered using a non-penetrating von-Frey monofilament over the same point. FMRI was performed with a 3T Siemens Trio scanner and 12-channel head coil (TR/TE=3s/30 ms). Brain correlates of sensation and those from block stimulation were regressed in a GLM. To compare brain encoding of sensation between VA and SA, a mixed effects paired t-test was used ($p < 0.05$).

RESULTS: Sensation time series correlation to block design was greater ($p < 0.001$) for SA (r=0.63), compared to VA (r=0.32). Persistence of sensation into the OFF block was evident for VA. For VA, fMRI group maps demonstrated on-line sensation was positively correlated with signal in cognitive, limbic, and sensory-discriminative brain regions. In contrast, the block regressor demonstrated more prominent signal decrease in default mode network (DMN) regions. Comparing brain encoding of sensation between VA and SA, greater activation for VA was noted in the anterior, posterior and rostral MFC, and ACC. Greater activity for SA was noted in S2 and left insula, greater deactivation was noted in the DMN.

CONCLUSIONS: Persistence of VA sensation could compromise block design fMRI analyses contributing to heterogeneity of past studies. Brain encoding of sensation for VA showed greater activity in cognitive-evaluative and emotional-interceptive frontal cortex regions. Frontal cortex recruitment by VA may contribute acupuncture's therapeutic effects. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

A VA Rotation for Chiropractic Students: Learning to Assess Older Patients in an Interdisciplinary Setting

Lisa Killinger, Palmer College of Chiropractic

INTRODUCTION: In September, 2008 Palmer College of Chiropractic received funding as part of a consortial Geriatric Education Center grant through the US Health Resources and Services Administration. The chiropractic college's role in the grant was participation in a clinical rotation focusing on comprehensive geriatric assessment. The goal of this activity was to offer interdisciplinary experience and training to chiropractic students in the principles of geriatric assessment and in the use of the standardized geriatric assessment instruments.

METHODS: This activity was carried out by offering an observational VA Hospital rotation to chiropractic students during their 3rd year Healthy Aging class. Students were selected on the basis of grade point average, referral from their clinical staff doctor, and a brief essay about their motivation for applying to the program. It is noteworthy that no chiropractor or chiropractic student has previously participated in any way at our local VA hospital prior to this project.

RESULTS: In each academic trimester, approximately 16 slots are available for chiropractic students to participate in the VA rotation. To date, 20 students have completed a rotation and by early 2009, 50 students will have participated. At the VA's geriatric assessment clinic, 2 students observe a 3 hour comprehensive geriatric assessment of one patient by an interdisciplinary team including a social worker, nurse, geriatrician and pharmacist. Students then participate in a team meeting wherein the overall patient care plan is developed. After their rotation, each student completes an electronic post-assessment to gather information about their experience and learning. A summary of student comments and results will be offered in this presentation.

CONCLUSIONS: Chiropractic students gain valuable interdisciplinary and geriatric assessment experience through the VA Rotation. In future years, the relationship developed through this grant activity may create opportunities for greater participation of chiropractors in this VA hospital setting. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Life Center for Seniors: A Descriptive Study of a Wellness-Based Mature Adult Learning Community

Ron Kirk, **Stephanie Sullivan**, Life University

INTRODUCTION: In the US the elderly population is growing rapidly and it is projected that this trend will increase as baby boomers reach the ranks of the elderly. A high percentage of elderly individuals in the United States face life with disabilities.

OBJECTIVE: Recognizing the health and social challenges of the burgeoning senior population, upper level administrators studied the possibility of creating a wellness-based learning center for senior citizens.

METHODS: The upper level college administration appointed a senior level administrator to serve as project manager to create a Center for Seniors housed on campus. After brainstorming and discussion sessions, the project manager and task force drafted a proposal, including a budget, director, staffing and office space needs. Center classes offered a variety of venues for senior citizens to enhance their health, increase their knowledge and develop new skills. Additionally Center members were afforded the unique benefits of free chiropractic care at the campus clinics.

RESULTS: The Life Center for Seniors now has 431 mature adult members. To give back to the campus community through service, the Center developed the OWLS volunteer corps.

DISCUSSION: The initial project objectives have been met. The Center for Seniors is a strong and viable mature adult learning community, providing multiple venues of holistic service to the local senior population.

CONCLUSION: The elderly population in the United States will approximately double in the next 25 years as baby boomers age. This population group will face many increasing health and social challenges. It is hoped that the Life Center for Seniors will serve as a model for other colleges to follow. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Promoting Healthy Lifestyles: A Retrospective, Qualitative Study of an Innovative Educational Methodology for First Health Professional Degree Students

Ron Kirk, **Richard Franz**, Life University

INTRODUCTION: Americans suffer from the burden of a multiplicity of lifestyle-related health disorders, including: obesity, coronary heart disease, cerebrovascular disease, hypertension, diverse cancers and type II diabetes. Studies indicate that health care providers with healthy lifestyles are more likely to help patients improve lifestyles.

OBJECTIVES: The primary purpose of this study is to describe the instructional methodologies used to improve students' sense of self-efficacy for lifestyle improvement after a wellness course.

METHODS: Wellness lecture/discussions focus on health assessments and lifestyle interventions designed to promote health and prevent disease. In the first week of laboratory class participation, students choose a wellness partner. The intent of the wellness partnering process is to provide accountability and reinforcement for positive health behavior changes through wellness planning. At the term's end students are asked to quantify the wellness orientation of their lifestyle on a scale of 1–10 pre and post class.

RESULTS: Based on post course completion assessments, students' self-reported wellness-orientation of lifestyle scores improved by an average of 2.42 points on a 1–10 scale.

DISCUSSION AND LIMITATIONS: Several studies indicate that a sense of self-efficacy (self-confidence) is important in facilitating health behavior change. It is heartening that wellness class students self-report improvement in the quality of their lifestyles after participation in this class. One major limitation of this descriptive study is that scores are self-reported, qualitative data.

CONCLUSIONS: The evidence is clear that living an active healthy lifestyle enhances health and reduces risk for common, deadly and disabling, chronic disorders. It is heartening that first professional degree students in a healthcare curriculum self report substantial lifestyle choice improvement after participation in a health promotion class. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Continuous Measurement of Muscle Morphology using Sonomyography: A New Technique to Quantify Chiropractic Treatment Efficacy

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BACKGROUND: Sonomyography (SMG), defined as the morphological changes of muscles under action detected by continuous B-mode ultrasound, can be used for functional assessment of muscles. To better understand the functional changes of muscles after chiropractic treatments, continuous monitoring of muscle morphology as well as other muscle related signals such as EMG and joint torque during muscle contraction would be beneficial.

OBJECTIVES: To develop an integrated system that allows for simultaneous collection of ultrasound images, EMG and torque signals, and to evaluate the reliability of an automated muscle boundary tracking algorithm for muscle thickness/deformation measurement.

METHOD: The system include a B-mode ultrasound scanner, a surface EMG measurement system, a dynamometer for joint torque measurement, and a personal computer with a frame grabber and a data acquisition card installed for capturing the ultrasound images and analog signals respectively. Software was developed to simultaneously collect ultrasound images, EMG, torque, and other signals. A muscle boundary tracking method based on two-dimensional cross-correlation algorithm was also developed to analyze the images. With informed consent, we evaluated the system by collecting SMG and EMG of the pectoral major muscle, and the shoulder adduction torque at rest and during isometric contraction for a healthy male subject.

RESULTS: The system succeeded in simultaneously collecting EMG, torque, and ultrasound images during isometric contraction. The average differences (SD) between the manually measured muscle thickness and those measured by our automated tracking algorithm were 0.15 (0.63), −0.29 (0.79), and 0.10 (0.37) mm respectively for the lateral, central, and medial locations.

DISCUSSION: Similarity between the manually measured and automatically tracked muscle thickness demonstrated the reliability of our muscle tracking algorithm. Potential applications of the system in chiropractic research include determining if manual or mechanical-assisted chiropractic manipulation, alone or combined with soft tissue manipulative therapies, are able to produce changes in muscle morphology. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Validity of Quantitative Rehabilitative Ultrasound Imaging Measurements to Assess the Morphology and Function of Muscles of the Trunk: A Systematic Review

Shane Koppenhaver, University of Utah, **Jeffrey Hebert**, University of Utah, **Eric Parent**, University of Alberta, **Julie Fritz**, University of Utah

OBJECTIVE: To systematically review the literature on the validity of using quantitative Rehabilitative Ultrasound Imaging (RUSI) measurements to assess the morphology and function of muscles of the trunk.

SUMMARY OF BACKGROUND DATA: RUSI is increasingly being used to evaluate muscle morphology and function in research and clinical applications. While using RUSI to measure muscle morphology has face validity, inferring about muscle function from these measurements is more complex. Examining the validity of RUSI for quantifying muscle function is therefore necessary before widespread use can be advocated.

METHODS: Original research articles that reported quantitative measures of trunk muscles using RUSI were identified. Data were extracted and categorized as relating to criterion-related validity, construct validity, and responsiveness. A modified Quality Assessment of Diagnostic Accuracy Studies (QUADAS) tool was utilized to assess study quality.

RESULTS: Twenty-four studies were included. Seven studies investigated criterion-related validity and suggested that while RUSI may be a valid measure of trunk muscle morphology, the validity of using RUSI to quantify muscle function is context dependent. Validity depends on the muscle involved, the contraction strategy utilized, and possibly the intensity of muscle contraction. Fourteen studies demonstrated construct validity and supported the ability of RUSI measurements to differentiate individuals based on back pain, anthropometry, and postures. Responsiveness information was lacking and minimally identified in 4 studies.

CONCLUSIONS: There is growing evidence that RUSI is a valid measure of trunk muscle morphology and function for specific muscles under specific conditions. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

A Two Year Retrospective Case Report on a Patient who Received Maintenance Care for Headaches, Neck Pain and Low Back Pain

Curt Krause, **Richard Strunk**, Cleveland Chiropractic College

INTRODUCTION: Chiropractic maintenance care (MC) is a common recommendation made by doctors of chiropractic (DC's). Despite a strong belief in chiropractic MC by DC's, there is limited evidence to support its use and value to patients.

METHODS: This retrospective case report describes the effects of two years of chiropractic MC. The Revised Oswestry Low Back Disability Questionnaire, Neck Disability Index, and Headache Disability Index were performed at baseline, one and five months from baseline and after two years of MC. The patient's symptoms were assessed qualitatively as "mild/minor", "moderate", or "severe" and were categorically totaled after two years. The patient's beliefs of chiropractic MC was assessed using a four-item survey two years after MC. Gonstead adjustments/spinal manipulation was performed at each visit in a private chiropractic office.

RESULTS: During MC, the patient was seen one time per month for two years. Results from the three outcome instruments indicated the patient improved significantly in all three areas at 5 months and two years. During MC, the patient reported six moderate headache episodes and one severe episode. During this same period, the patient reported four episodes of mild low back pain and two episodes of mild neck pain. The patient also had one episode of moderate neck pain. In the MC survey, the patient indicated that her symptoms were completely gone, with her headaches being affected the most, her general health was greatly improved, and that she was very likely to continue MC in the future. She also stated the chiropractic care was very valuable to her.

CONCLUSION: This case illustrates a patient who maintained the low levels of pain and disability attained from active care through a two-year course of chiropractic MC. Case reports, such as this, are an important step towards learning more about chiropractic MC and its effects. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Prevalence of Posticus Ponticus Within a Chiropractic Health Center Patient Population

Patricia Kuhta, **John Hart**, **Laura Greene-Orndorff**, **Beth McDowell-Reizer**, Sherman College of Straight Chiropractic

INTRODUCTION: The potential clinical significance of posticus ponticus is controversial since the majority of patients with this finding are asymptomatic. It has been suggested that posticus ponticus may contribute to vertebral artery compression, vertebrobasilar insufficiency, or vertebral artery dissection. This study sought to determine the prevalence of posticus ponticus.

METHODS: From the archived records in the Sherman College Health Center, 304 lateral cervical spine radiographs were randomly selected. Four independent examiners assessed the radiographs; two (Examiners A and B) for approximately one-half of the 304 and the other two (Examiners C and D) for the remainder of the films for the presence of posticus ponticus in any of its forms. The number of radiographs showing posticus ponticus, as well as analysis of agreement between examiners (using the kappa statistic) was calculated.

RESULTS: There were 60 radiographs where the examiners disagreed as to the presence or absence of posticus ponticus. These 60 were not counted for prevalence of posticus ponticus but were included in the kappa analysis. Among the remaining 246 radiographs, 112 (46%) showed some type of posticus ponticus while 132 (54%) did not show any posticus ponticus finding. Examiners A and B showed a kappa score agreement of 0.72 and Examiners C and D showed a kappa score agreement of 0.51.

DISCUSSION: The kappa scores for both sets of examiners show acceptable agreement. Within this population, the finding of 46% prevalence of some type of posticus ponticus is similar to that of Yochum & Rowe who suggest up to 50% occurrence. Among the references sited in our study, the prevalence of posticus ponticus was found to range between 9–72%, with an average of 21%.

CONCLUSION: Within this population sample, 46% showed some type of posticus ponticus. Future research should be conducted on other populations for comparison purposes. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Acetabular Labral Tear Presenting in a Competitive Gymnast: Case Report and Review of the Literature

Alexander Lee, **Jason Pajaczkowski**, **Stephanie Freeman**, Canadian Memorial Chiropractic College

INTRODUCTION: Symptomatic acetabular labral tears present potential performance obstacles for athletes. The present case describes an athletic presentation of a competitive gymnast with signs and symptoms consistent with an acetabular labral tear. The steps in making a diagnosis and the conservative management strategies that led to continued training and competition are discussed.

CLINICAL FEATURES: A 25 year old competitive female gymnast presented with activity-induced deep, sharp, pinching, posterior left hip pain on her take-off leg while performing an aerial gymnastic maneuver. The pain started 4 years prior, and has gradually progressed. She reported no pain at rest, but was able to reproduce her symptoms at the precise instant of impact loading on her plant-leg while performing aerials. Her left hip ached globally with prolonged walking and running. Magnetic resonance imaging was obtained. A suspicious small undisplaced incomplete posterosuperior labral tear was identified.

INTERVENTION AND OUTCOME: The patient was managed conservatively. The gymnast was counseled to modify aerial technique by explosively plantar flexing the ankle to generate the required moment to perform the aerial to offset acetabular labral loading. Rehabilitation focused on improving precision of movement and hip muscular endurance with tri-planar hip stability exercises. Optimal lower limb myofascial tension was achieved by treatment with Active Release Techniques in labral-sparing hip positions. The combination of these therapies allowed the gymnast to continue training and remain competitive.

DISCUSSION: Recent advances in arthroscopic technology have led to a resurgence in the investigation of hip labral pathology. A review of the literature examining the current body of knowledge concerning acetabular labral tears is presented. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Biomechanics of the Gonstead Cervical Chair Thrust on a Mannequin

Yongjik Lee, **Maruti Gudavalli**, **Edward Owens**, Palmer Center for Chiropractic Research

INTRODUCTION: The data of biomechanics of Gonstead (side-specific, short-lever-arm adjustment) cervical chair thrust will be useful for improving technique education by setting standards on performance of the procedure. The purpose of this study was to quantify peak PA force, head tilt degree, and head motion displacement of the cervical mannequin when 3 Gonstead clinicians delivered a thrust to a mannequin 10 different times.

METHODS: This study was approved by the college's IRB. We recruited 3 experienced Gonstead doctors from the college. A Bertec force plate was used to measure peak PA force. Electromagnetic sensors were attached to the back of the head to measure head tilt degree and PA head displacement. Three clinicians delivered thrust on a mannequin to a marked dot (C7 level) to measure biomechanical characteristics, and to describe the variability between 3 clinicians as well as within a single clinician. Using MathCAD software, we reduced the data and transferred it into SPSS dataset to calculate the mean and SD of the primary outcome variables for each clinician.

RESULTS: All 3 clinicians delivered a similar amount of peak PA force (right; 119.7N, left; 112.6N), peak lateral force (right: 51.9N, left: 51.6N), and sagittal tilt (right; 32.00, left; 28.20) for the right and left sides. Within a single clinician, however, each clinician had different PA force magnitudes, with clinician 1 having higher values, followed by clinicians 3 and 2. All clinicians had slightly more sagittal head tilt than lateral on both sides before thrusting on the mannequin.

CONCLUSION: This is the first study providing the biomechanical characteristics of Gonstead cervical chair thrust, and it gave us valuable experience in the measurement of biomechanical variables. We will measure these biomechanical characteristics for future studies in human patients while delivering the Gonstead cervical thrusts. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Management of Operation Enduring Freedom and Operation Iraqi Freedom Veterans in a Veterans Health Administration Chiropractic Clinic

Anthony Lisi, VA Connecticut Healthcare System

BACKGROUND: Chiropractic services are being delivered in the Veterans Health Administration (VHA) and there are little published data describing such. There are no data on the subpopulation of Operation Enduring Freedom [Afghanistan] and Operation Iraqi Freedom (OEF/OIF) veterans receiving VHA chiropractic services.

OBJECTIVE: To describe processes and outcomes of care for OEF/OIF veterans seen in a VHA chiropractic clinic.

DESIGN: Retrospective review of consecutive cases.

METHODS: The electronic medical record of the VA Connecticut Healthcare System (VACHS) was reviewed and all new consultations of OEF/OIF veterans over a 6-month period were identified. Records were reviewed for patient characteristics, elements of chiropractic management, and outcomes to care. Data were extracted and entered into a spreadsheet for analysis.

RESULTS: Thirty one cases were identified. The average patient age was 28.5 years and there was a 4 to 1 male to female ratio. Forty-eight percent of consultations were initiated by primary care and 26% by physiatry. The most common patient complaints were low back pain without leg pain (35%) and thoracic pain (32%). Twenty-four cases (77%) screened positive for Post Traumatic Stress Disorder. All patients received evaluation and management services, education, exercise and spinal manipulation. Adverse events (increase in pain self resolving in 12–48 hours) were reported by 45% of patients. Fifty-two percent of patients reported a clinically important pain decrease. Fourteen cases (45%) were satisfied with outcomes and required no additional follow up from other services. Eleven patients (35%) were consulted to other services, most commonly physiatry or mental health.

CONCLUSION: Services delivered to a group of OEF/OIF veterans at one VHA chiropractic clinic have been described. A better understanding of the characteristics of these particular patients and the elements of care received in VHA chiropractic clinics is needed to improve effective, efficient delivery of care. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Stakeholder Perceptions Toward Integrating Research into CAM Education

Michele Maiers, Northwestern Health Sciences University, **Louise Delagran**, University of Minnesota, **Lori Baldwin**, Northwestern Health Sciences University, **Mary Jo Kretizer**, University of Minnesota, **Roni Evans**, Northwestern Health Sciences University

INTRODUCTION: Complementary and alternative medicine (CAM) educational institutions face the contemporary charge to include research content and model evidence-informed practice in their curricula. The purpose of this project was to determine stakeholders' perceptions of research-related competencies, which were developed to increase research education in the curricula at Northwestern Health Sciences University (NWHSU).

METHODS: A series of focus groups were conducted with faculty, students, and clinicians to identify research-related attitudes and behaviors they would like to see among students, and their thoughts of how field practitioners would use research in practice. Content analysis was applied to transcribed interviews, with results summarized and representative quotes identified. This project was approved by the institutional review boards at NWHSU and the University of Minnesota.

RESULTS: Two focus groups were conducted with faculty, 2 with students, and 1 with field clinicians. Overall, responses were affirming of the direction of the research competencies, and several ideas for experiential opportunities to integrate research concepts in academic and clinical programs were identified.

DISCUSSION: These focus groups highlighted the readiness with which faculty, students, and clinicians could identify practical ways research enhances clinical practice and improves communication with a variety of stakeholders. Additionally, there appeared to be a genuine enthusiasm for a cultural shift at NWHSU that would champion the integration of research as a means of improving the growth and stature of these CAM professions.

CONCLUSION: Seeking the perspective of stakeholders is a valuable and informative step in the successful integration of research in CAM curriculum. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Preadmission Organic Chemistry Courses are Predictors of Academic Performance in Biochemistry at a Midwest Chiropractic College

Marc McRae, National University of Health Sciences

BACKGROUND: Organic chemistry has been shown to predict academic success in the preclinical years of other health care fields. There has been only one study that observed a positive correlation between entry level grade point average and biochemistry, but there have been no published studies investigating organic chemistry's role in predicting academic success in a chiropractic program's biochemistry course. The purpose of this study is to examine this relationship.

METHODS: Students enrolled in a first semester biochemistry course who had completed the prerequisite courses in organic chemistry offered at this same institution were entered into the study. The same instructor was utilized for both prerequisite organic chemistry courses (organic 1 and organic 2) and the biochemistry course. The curriculum and content covered in all 3 courses was held constant for the 10 semester duration of the study. The total grade for each of the 3 courses was calculated using the midterm and final exam raw scores with a weighting of 50% each. Statistical analysis consisted of obtaining correlation coefficients between the total grades of organic 1 with biochemistry and organic 2 with biochemistry. Using the biochemistry total grade the students were divided into quartiles and course grades for both organic chemistry 1 and 2 were calculated.

RESULTS: For the 109 students entered in to the study the correlation coefficient between the biochemistry and organic chemistry 1 and biochemistry and organic chemistry 2 courses was 0.744 and 0.725 respectively. The difference in organic chemistry grades between those in the 1st and 4th quartiles was 63.2% and 86.9% for organic chemistry 1 ($p=0.000$); and 60.9% and 79.4% for organic chemistry 2 ($p=0.000$).

CONCLUSION: Organic chemistry can be used as a predictor of future academic success in a chiropractic biochemistry course. Knowledge of such a relationship could prove useful to identify students who may potentially run into academic difficulty with first year biochemistry. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Educating Chiropractic Students About Intra-observer and Inter-observer Variability Through the use of Skinfold Measurement

Marc McRae, National University of Health Sciences

BACKGROUND: Objective data is often obtained by chiropractic physicians for evaluating pre-treatment and post-treatment outcomes, but objective measurements taken on any patient will always be subject to both intra-observer and inter-observer variability. Skinfold measurements taken by novice observers are fraught with high rates of intra-observer variability and even higher rates of inter-observer variability and therefore having students collect and analyze skinfold measurements is an ideal way for presenting the concepts of both measurement and physiological variability.

METHODS: During the pre-laboratory meeting time for a first trimester clinical biochemistry laboratory, students were asked to arrange themselves into groups of four. Within each group one student was asked to volunteer as a subject, two students were asked to volunteer as observers and the remaining student was asked to be the data recorder. To demonstrate inter-observer versus intra-observer variability the subject was assessed by four separate observers (inter-observer) who each took four separate skinfold measurements (intra-observer) at four separate locations (bicep, tricep, subscapular and suprailiac) using Lange skinfold calipers. The average sums of the skinfold measurement (in mm) and standard deviations (in mm) were calculated and posted on the black board for post-laboratory discussion.

RESULTS: In this demonstration project skinfold measurements were taken on 54 first trimester chiropractic student subjects (33 males and 21 females). The average intra-observer and inter-observer variability across all 54 subjects was 4.4 ± 2.2 mm and 10.0 ± 6.2 mm respectively. This is a 2.27 fold increase in variability and this difference was statistically significant (p=0.000).

DISCUSSION: The differences between intra-observer and intra-observer variability provided a back drop for post-lab discussion, which was the intended purpose of performing this demonstration project. More importantly this project demonstrates that measuring skinfold thickness can prove to be a useful method for easily, safely and inexpensively demonstrating the concepts of variability to students. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Student Learning in a Collaborative Testing Environment

Christopher Meseke, Palmer College of Chiropractic Florida, **Jamie Meseke**, Walden University, **Rita Nafziger**, Palmer College of Chiropractic

OBJECTIVE: This study examined the use of collaborative testing as a learning tool and its effect on student learning at a chiropractic college.

METHODS: This project was approved by the Palmer College of Chiropractic Institutional Review Board. This study compared testing performance between two cohorts of students taking an advanced neuroanatomy course: a control group (n=78) and an experimental group (n=80). Scores examined for each cohort included sums of quizzes, examination scores, and a comprehensive final examination. The control cohort completed weekly quizzes as individuals, while the experimental cohort completed the quizzes collaboratively in small groups. Both cohorts completed the unit examinations and the comprehensive final examination as individuals. Additionally, pretest-posttest and delayed posttest scores were examined. Multivariate Analysis of Variance (MANOVA) and Multivariate Analysis of Covariance (MANCOVA) were used for statistical analysis.

RESULTS: The experimental cohort scored significantly higher compared to the control cohort on all quizzes ($F=217.761$; $df=1,156$; $p < 0.05$) and overall course grades ($F=16.099$; $df=1,156$; $p < 0.05$). There were no significant differences in either the comprehensive final (posttest) ($F=3.138$; $df=1,122$; $p > 0.05$) or the delayed posttest (taken 5 weeks after the end of the course) ($F=0.431$; $df=1,122$; $p > 0.05$) between the two cohorts. The overall scores on the delayed-posttest were significantly lower than the posttest scores ($F=4.660$; $df=1,122$; $p < 0.05$).

CONCLUSIONS: This project extends previous findings that students using collaborative testing had significantly increased course performance compared with those students using traditional testing. No differences in learning or retention were noted. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Revision of the Primary Care Assessment Survey for Assessing Patient Centered Care in Chiropractic Practice

Silvano Mior, Canadian Memorial Chiropractic College

INTRODUCTION: The nature and length of the patient-provider relationship is considered to be important in quality patient-centered care. Despite suggestions that chiropractic is patient-centered, there is little evidence supporting this claim. The Primary Care Assessment Survey (PCAS) is a patient-answered questionnaire that taps the seven characteristics of patient-centered care using 11 summary scales. PCAS has excellent measurement properties across a varied population mix. The purpose of this study was to assess the psychometric properties and outcomes of a modified PCAS-C to assess patient-chiropractor relationship.

METHOD: Data were collected from chiropractic patients in Southern Ontario. Patients self completed the PCAS-C after their chiropractic visit, returning it to the study office. The chiropractor's and the patient's name were coded to ensure confidentiality. Principal axis factoring with oblique rotation was used to assess item loading. Scale and subscale reliabilities were calculated using Cronbach's alpha. Inter-item and inter-scale correlations were also determined. Summary scores were calculated for each subscale.

RESULTS: 2999 surveys were collected. Items had similar means and standard deviations and skewed towards the higher score. The six factors explained almost 67% of the total variance. All the items loaded on their respective original subscales. The alpha coefficients for each of the six subscales analyzed ranged from 0.771 to 0.942. The reliability for the PCAS-C was $\alpha\pm = 0.871$ and inter-subscale to total scale correlations ranging from 0.430 to 0.786. The values reported by the chiropractic patients were higher for each of the subscales but followed a similar trend when compared to medical patients.

DISCUSSION: This study supports the scaling and item loadings in PCAS-C as originally defined by Safran. Overall, the findings suggest that chiropractic patients reported receiving quality patient-centered care as determined from the high subscale scores. The PCAS-C has the potential to be used to benchmark the quality of chiropractic care. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Minimally Responsive Carpal Tunnel Syndrome with Underlying Avascular Necrosis of the Scaphoid: A Case Report

Kenice Morehouse, **Stephen Grand**, **Catherine Niblack**, Palmer College of Chiropractic Florida

INTRODUCTION: Carpal Tunnel Syndrome is a median nerve compression neuropathy occurring at the wrist in the carpal tunnel. It is the most common mononeuropathy, and as such is seen frequently in chiropractic offices. The scaphoid (navicular) carpal bone is the most frequently fractured bone in the wrist, and is a common site for avascular necrosis. This is the case report of a patient with an intersection of these two conditions.

CASE DESCRIPTION: A 63 year old male presented to a chiropractic college clinic with complaints of paresthesia, pain and clumsiness in his left distal upper extremity. He also had a past history of a scaphoid fracture with non-union in the same hand 20 years previously, for which he had refused recommended surgery. He was treated with conservative methods with minimal improvement, and was subsequently referred for diagnostic imaging and NCS. These studies revealed severe median neuropathy and avascular necrosis of the scaphoid, accompanied by osteoarthritis.

DISCUSSION: This patient's condition of carpal tunnel syndrome was complicated by the presence of an old scaphoid fracture accompanied by avascular necrosis. This case underscores the need for a thorough review and consideration of the patient's past medical history, especially as it relates to the area of chief complaint. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Midwifery Views on Chiropractic; A Survey of North American Midwives

Linda Mullin, Life University & International Chiropractic Pediatric Association, **Lydia Dever**, Life University & International Chiropractic Pediatric Association, **Derek Barton**, Life University

INTRODUCTION: Midwives have a focus on a more natural means of healthcare during the pregnancy process. Chiropractic works with the body's innate ability to self-regulate and adapt to its environment. Both professions work with women throughout the course of their gestational periods to ensure the health of both mother and child, however, it is not known the extent to which these professions work in conjunction with each other. There is little information available about the attitudes or knowledge of midwives on the role of chiropractic care during pregnancy.

METHODS: An online survey consisting of 26 questions was sent out to 9000 subscribers of an online newsletter from Midwifery Today Magazine. Questions in the survey covered five areas of interest including demographics, training in chiropractic, experience with chiropractic (both personal and private), perception of safety of chiropractic for pregnancy and for children, and identification of conditions that chiropractors manage during pregnancy.

RESULTS: Of the 9000 surveys sent out, 186 licensed and practicing midwives completed the survey in its entirety. The results showed that 60% of midwives in this study were exposed to some form of chiropractic training. Most admitted making a referral to a chiropractor and three quarters had referred an infant. All of the respondents said that chiropractic was safe during pregnancy and nearly all said it was safe for infants.

CONCLUSION: Based on study results, practicing midwives have a favorable attitude toward chiropractic care during pregnancy and for infants. While this study is limited in its scope and further statistical analysis is necessary, it does show promise and set the ground work for future studies on a larger scale. Chiropractic and midwifery share similar goals in managing pregnancy and infants. Increased communication and knowledge between these professions would better benefit the population that they serve. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Effect of Spinal Manipulation on Exercise Rehabilitation Neuromuscular Outcome Measures for Patients with Chronic Neck Pain: A Pilot Study

Bernadette Murphy, University of Ontario Institute of Technology, **Paul Marshall**, University of Auckland, **Heidi Haavik Taylor**, New Zealand College of Chiropractic

BACKGROUND: 67% of people will suffer neck pain at some point in their lives. Abnormal muscle recruitment patterns may lead to a cycle of impaired movement patterns, which result in neck pain becomig chronic. Spinal manipulation combined with exercise has been shown to decrease pain and disability in patients with chronic low back pain and this improvement can be partially attributed to improved neuromuscular activation patterns. The purpose of this pilot study was to apply this model from the back to the neck and also to determine whether similar changes in neuromuscular activation occurred in chronic neck pain patients.

DESIGN: This pilot study was a randomized controlled trial comparing chiropractic care combined with exercise versus exercise only for participants with chronic neck pain. Group 1 received 4 weeks of chiropractic care, and Group 2 waited 4 weeks before both groups participated in an 8-week exercise intervention. The following outcome measures were assessed in week 1 (baseline), week 4 and at week 12: Neck Disability Index (NDI); Visual Analogue Scale; Neck flexion-relaxation (FR) response and feed forward activation times.

OBJECTIVES: 1) To determine whether a 4-week period of chiropractic care improves the ability of patients to respond to an 8-week period of exercise rehabilitation on indices of disability, and neuromuscular function. 2) To determine effect sizes for any changes in neuromuscular activation patterns.

RESULTS: There was a significant reduction observed in functional disability and pain levels in both groups. There were medium effect size changes in feed forward activation for both groups and for the FR response in the exercise group.

CONCLUSIONS: Chiropractic care combined with exercise and exercise alone are both effective at reducing functional disability and pain in chronic non-specific neck pain patients, which may be related to improved neuromuscular measures. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Cervical Spondylosis with Spinal Cord Encroachment: Should Preventive Surgery be Recommended?

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Christopher Coulis, Shoreline Spine & Pain Associates & University of Bridgeport College of Chiropractic,
Jonathan Gerrard, Aquarius Chiropractic

PURPOSE: It has been stated that individuals who have spondylotic encroachment on the cervical spinal cord without myelopathy are at increased risk of spinal cord injury if they experience minor trauma. Preventive decompression surgery has been recommended for these individuals. The purpose of this paper is to provide the non-surgical spine specialist with information upon which to base advice to patients. The evidence behind claims of increased risk is investigated as well as the evidence regarding the risk of decompression surgery.

METHODS: A literature search was conducted on the risk of spinal cord injury in individuals with asymptomatic cord encroachment and the risk and benefit of preventive decompression surgery.

RESULTS: Four studies on the risk of spinal cord injury in this population were identified. All reported increased risk. However, none were prospective cohort studies or case-control studies, so the designs did not allow firm conclusions to be drawn. A number of studies and reviews of the risks and benefits of decompression surgery in patients with cervical myelopathy were found, but no studies were found that addressed surgery in asymptomatic individuals thought to be at risk. The complications decompression surgery range from transient hoarseness to spinal cord injury, with rates ranging from 0.3% to 60%.

CONCLUSIONS: There is no clear evidence that individuals with spondylotic spinal cord encroachment are at increased risk of spinal cord injury from minor trauma. Prospective cohort or case-control studies are needed to assess this risk. There is no evidence that prophylactic decompression surgery is helpful in this patient population. Decompression surgery appears to be helpful in patients with cervical myelopathy, but the significant risks may outweigh the unknown benefit in asymptomatic individuals. Thus, broad recommendations for decompression surgery in suspected at-risk individuals cannot be made. Recommendations to individual patients must consider possible unique circumstances. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Technique Systems used by post-1980 graduates of the Canadian Memorial Chiropractic College practicing in five Canadian provinces: A preliminary study

Chad Mykietiuk, **Megan Wambolt**, **Travis Pillipow**, **Christa Mallay**, **Brian Gleberzon**, Canadian Memorial Chiropractic College

INTRODUCTION: The purpose of this study was to determine which, if any, techniques systems our graduates sought out instruction in and/or were utilizing either primarily or secondarily for patient care, in addition to Diversified technique.

METHODS: We surveyed 200 randomly selected post-1980 graduates of our college practicing in five Canadian provinces.

RESULTS: Eighty-three eligible data sets were received. Respondents reported to have sought out instruction in a total of 187 technique systems other than Diversified technique. In addition, although 86% of respondents stated they primarily used Diversified technique in practice, they reportedly used 134 different technique systems secondarily for patient care. This calculates to an average of 2.27 different technique used per respondent. The technique systems most commonly used in addition to Diversified techniques by the respondents in this study were Activator Methods Chiropractic Technique, Active Release Therapy, Thompson Terminal Point and Sacro-Occipital Technique.

CONCLUSION: These findings are consistent with previous data collected on this topic. Future studies should survey a larger percentage of practitioners to better assess the validity of these findings. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Orientation for Chiropractic Interns and a Department of Veterans Affairs Medical Center: An Example of Shared Responsibility

Jason Napuli, New York Chiropractic College& Department of Veterans Affairs Medical Center Bath New York

OBJECTIVE: The purpose of this paper is to describe a collaborative orientation process provided to student interns who rotate through three Department of Veterans Affairs Medical Center Chiropractic Clinics which have an academic affiliation with New York Chiropractic College.

METHODS: The Department of Veterans Affairs requires all students who will rotate through a VA Medical Center progress through a lengthy process of orientation. In order to create an efficient and time effective method a two part orientation process was created in collaboration with staff members at the VA Medical Center and New York Chiropractic College. A series of learning objectives were created to assist with the development. Upon implementation of the orientation a staff perception survey was administered to identify student preparedness, efficiency and effectiveness.

RESULTS: The student orientation that was created for the VA Upstate NY Health Care System was designed to expedite the process and help facilitate collaboration among three sites. This has reduced the amount of resources and time needed to process the students through the VAMC. This orientation has allowed the VAMC staff to efficiently process an increasing amount of chiropractic interns who will rotate through the VA chiropractic clinics.

DISCUSSION: This process is the first of its kind and has allowed the VA Medical Staff and New York Chiropractic College to orient incoming chiropractic interns into the system in a time efficient manner. It could be used as a model for other VA Medical Centers and chiropractic institutions that will develop academic affiliations in the future. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Future Chiropractors and Health Promotion: Implication of Chiropractic Education

Harrison Ndetan, Parker College of Chiropractic, **Williard Evans, Jr**, Cleveland Chiropractic College, **Ronald Williams, Jr**, Southeast Missouri State University

PURPOSE: The routine use of health promotion (HP) in integrative health care has been emphasized. The Council on Chiropractic Education (CCE) has put in place a new standard for the delivery of health promotion (HP) and wellness-based education for America's chiropractic colleges. This study was designed to assess the intentions and explore possible predictors on the use of HP by graduating chiropractic interns in future practice.

METHODS: The study used a survey design applying the Theory of Reasoned Action to explore the intentions, attitudes, beliefs and key influencing factors of 285 graduating interns at a chiropractic college on the use of HP in future practice. The survey comprised of 20 questions with 5-point Likert scale based on what health care providers should do in an optimal, patient-centered practice regarding HP. Chi-squared/Fisher's exact tests and multiple logistic regression models were used in analyzing data with SPSS version 16.0 for Windows.

RESULTS: About 90% of interns indicated they would use HP routinely in practice. Females were more likely to say they would do so than males [OR(95%CI) =3.6(1.2, 100.9)]. Whether or not HP is approved by colleagues [OR=13.8(3.4, 56.0)], clinic staff [OR=0.1(0.02, 0.8)], key influencers [OR=18.1(3.7, 88.8)], law in state of practice [OR=6.0(1.4, 26.7)], and beliefs on whether or not it is a health care provider's job to perform HP [OR=31.5(3.0, 330.0)] were significant predictors to intention to use HP in future. Also, perceived availability of time, possession of skills and whether interns felt education emphasized HP were significant determinants.

CONCLUSION: A majority of the interns plan to use HP in practice. Significant others interacting with interns including educators, influencers of future practice style and colleagues are as much a predictor of who will use HP in practice as having skills and/or time to do so. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Balance Control in the Elderly: Do Masters Athletes Show more efficient Balance Responses than Healthy Older Adults?

Christina Neros, Palmer College of Chiropractic Florida, **Sandy Brauer**, University of Queensland, **Marjorie Woollacott**, University of Oregon

BACKGROUND AND AIMS: Older adults can improve several components of their balance such as timed stance ability by participating in a short specific exercise program. However, it is not clear whether participation in more frequent and intense training can result in improved reactive balance performance in older adults. Optimal reactive responses are required to prevent falls. This study begins to evaluate this issue by comparing the reactive balance ability of elite older adults (Masters athletes) to that of healthy older adults.

METHODS: Kinetic and electromyography data were collected from elite older athletes and healthy older adults during backward linear underfoot perturbations at high and low speeds. Behavioral outcomes of postural recovery strategy, timing and levels of muscular activation, and time to stabilize the displaced center of pressure were measured and compared between groups.

RESULTS: The elite older athletes were able to more frequently regain balance without stepping, stabilized their center of pressure faster than did healthy older adults and activated their tibialis anterior with a greater magnitude when perturbed at the higher speed. There were no differences between groups in these measures at the lower perturbation speed and no differences in onset latencies at either speed.

CONCLUSIONS: Older athletes undertaking long-term high intensity training demonstrate better more rapid stabilization of posture following perturbation than healthy older adults under challenging conditions. Further studies are advocated to determine the relative contribution of processes such as neuromotor adaptation, strength, motivation and arousal to this finding. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Spinal Manipulation Impacts Cervical Spine Movement and Fitts' Task Performance

Steven Passmore, New York Chiropractic College; VA of Western New York Healthcare System; McMaster University, **Jeanmarie Burke**, New York Chiropractic College, **Christopher Good**, University of Bridgeport, **James Lyons**, McMaster University, **Andrew Dunn**, VA of Western New York Healthcare System & New York Chiropractic College

INTRODUCTION: The effects of cervical manipulation on various aspects of human performance are largely unstudied. The objective of this study was to determine if active cervical range of motion (ROM) and Fitts' task movement time differences occurred following high velocity low amplitude (HVLA) cervical spinal manipulation (SM) across various indexes of difficulty.

METHODS: A single-blind randomized before-after trial was performed in a motor performance laboratory. Fifteen volunteers (21–42 y) with asymptomatic palpable intervertebral motion restriction at the C1-C2 level were randomly assigned to a SM group or to a no intervention (NI) group. A single episode of upper cervical manipulation was performed on the SM group. Active cervical ROM and movement time was measured pre and post treatment in the SM group and compared to similar measurements in the NI group.

RESULTS: In the SM group active cervical ROM in rotation increased after the intervention (pre: $74.75° \pm 7.63°$, post $78.50° \pm 7.23°$, $t(8) = -3.07$; $P < .02$). During the second trial significant group differences were present in the SM group for movement time in direction congruent conditions ($F(8,48) = 2.83$; $P < .02$) and direction incongruent conditions ($F(8,48) = 2.31$; $P < .05$) but not for the NI group.

CONCLUSIONS: A linear relationship between indexes of difficulty and movement time as predicted by Fitts' Law was observed. Significant group effects indicate that SM not only increases cervical AROM, but also facilitates the performance of a cervical spine Fitts' task requiring rotation. This task may be utilized to quantify motor performance in clinically symptomatic populations with reduced ROM who are appropriate candidates for SM. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Salmonella Spondylodiscitis in a 15 Year Old Male Presenting With Back Pain: A Case Report

Christopher Petrie, **Farshid Marzban**, **Afsar Sokhansanj**, **Concetta Tofan**, **Kenneth Garrett**, Parker College of Chiropractic

INTRODUCTION: Infectious spondylitis is uncommon and is most frequent in the lumbar spine. Staphylococcus aureus is the most frequently implicated etiological agent. Persistent vascularity to the disc in children provides a hematogenous route to the disc resulting in initial involvement of the disc (discitis) with spread to the adjacent vertebral bodies. The case presented here is distinctly unusual, both for its location of involvement (thoracic disc and adjacent bodies) and the infective agent involved (salmonella).

CLINICAL FEATURES: A male, 15 years of age, presented with thoracic spine pain. Conservative management that included chiropractic manipulative therapy and acupuncture was pursued but did not result in clinical improvement. Symptoms progressed with the development of a fever after several weeks. Plain films were essentially negative. MR examination showed edemic changes in the involved vertebral bodies. A paravertebral soft tissue mass was noted. The patient was diagnosed with pyogenic spondylitis and referred to an infectious disease specialist and a spine surgeon for comanagement.

INTERVENTION AND OUTCOME: Antibiotic therapy was initiated and continued for 87 days. A biopsy of the prevertebral mass revealed salmonella type E/G bacteria upon culturing. Follow-up MR exam demonstrated a reduction in size of the paravertebral abscess and no involvement of the spinal canal. Clinical followup at one year shows symptom improvement and increased function.

DISCUSSION AND CONCLUSION: Infection of the spine is an infrequent, but clinically important condition that can affect patients of all ages. Radiographic findings include loss of disc height, adjacent endplate destruction and the presence of a paravertebral soft tissue mass. Advanced imaging can detect early involvement and suggest the diagnosis. Primary differential consideration should be given to advanced degenerative changes and neoplastic involvement. Prompt treatment with appropriate antibiotic therapy reduces long-term complications that can include ankylosis, spinal deformity, neurological impairment and rarely, para- or quadriplegia. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Kinematic and Electromyographic Parameters of the Cervical Flexion Relaxation Phenomenon: The Effect of Trunk Positioning

Jean-Philippe Pialasse, **Jean-Daniel Dubois**, **Danik Lafond**, **Martin Descarreaux**, Université du Québec à Trois-Rivières

BACKGROUND: The cervical flexion-relaxation phenomenon (FRP) is a neck extensor myoelectric silence that occurs during complete cervical flexion. The aim of this study was to assess the presence of this phenomenon in the cervical region and to explore the kinematics and EMG parameters in two different experimental conditions.

MATERIALS AND METHODS: Nineteen young healthy adults ($22.2 \pm 2,4$ years), without any cervical pain history participated in this study and performed each of the experimental conditions. They had to accomplish a cervical flexion from a neutral seated position and from a 45° forward leaning seated position. Neck kinematics was assessed using a kinematic capture device in order to assess onset and cessation angle of the PFR. Cervical paraspinal, and trapezius muscles EMG activities were also recorded. All data were compared in order to assess the differences between the two experimental conditions.

RESULTS: Eighteen of the nineteen subjects showed a FRP. The phenomenon appears between 72.6 and 76.3 % of maximal cervical flexion, and disappears during the return to neutral position between 91.9 and 93.1 % of maximal cervical flexion. The FRP was observed, at least unilaterally, in 84.2 % (67.4 % bilaterally) of tasks without forward bending of trunk, and 90.5 % (79.0 % bilaterally) of tasks with 45° forward bending of trunk. A significant increase in the flexion-relaxation ratio was observed in the 45° forward leaning condition. No significant difference could be observed between the two experimental conditions for the kinematics parameters.

CONCLUSION: The results of the present study indicate that cervical spine flexion in healthy subjects is characterized by a flexion relaxation response. Moreover, the results indicate that trunk inclination might facilitate the evaluation of the cervical flexion relaxation phenomenon. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Vertebral Sarcoidosis of the Lumbar Spine: A Case Report

Jean-Nicolas Poirier, New York Chiropractic College, **Christopher Petrie**, Parker College of Chiropractic

OBJECTIVE: The purpose of this paper is to present an educational retrospective case study of an adult male patient suffering from low back pain who was diagnosed with multilevel vertebral sarcoidosis of the lumbar spine.

CLINICAL FEATURES: A 64 year-old male presented with chronic low back pain with radiation down the left leg to the calf. He had severe ambulatory limitations and complained that he could not sit. A disc herniation was clinically suspected at L5-S1.

INTERVENTION AND OUTCOME: A period of conservative treatment proved unsuccessful at reducing the symptoms. A magnetic resonance imaging examination of the lumbar spine was performed to evaluate the integrity of the lumbosacral disc. A large disc bulge was seen at L5-S1, accompanied by advanced facet arthrosis, ligamentum flavum hypertrophy, spinal canal stenosis and bilateral neural foraminal encroachment. Multiple osseous lesions were also seen within the vertebral bodies of L1-S2. The lesions appeared sharply delineated and demonstrated homogeneous low signal intensity on T1-weighted and T2-weighted sequences. A biopsy sample revealed the presence of a noncaseating granulomatous disease. The patient was diagnosed with vertebral sarcoidosis. A chest radiographic examination failed to demonstrate any mediastinal or pulmonary involvement of the disease. He did not receive any treatment for sarcoidosis. He continued a period of conservative care that eventually improved his low back pain. The true etiology of the pain (mechanical low back vs. osseous sarcoidosis) was never established.

CONCLUSION: Vertebral sarcoidosis is a rare and usually painful condition. It may be the first clinical manifestation of the disease. The imaging findings are variable and nonspecific and may simulate malignant neoplasms. Biopsy is required for accurate diagnosis. The course of the disease is variable and spontaneous improvement has been reported. Management of vertebral sarcoidosis remains controversial since prospective controlled studies have not been reported. When treatment is considered, corticosteroids are frequently used as the first-line therapy. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Combined Multimodal Therapies for Chronic Tennis Elbow: A Feasibility Study

Mohsen Radpasand, **Edward Owens, Jr**, **Joel Pickar**, **Dave Juehring**, Palmer College of Chiropractic (Palmer Center for Chiropractic Research)

OBJECTIVE: To develop and test protocols for a randomized clinical trial (RCT) of combined multimodal therapies for chronic tennis elbow utilizing quick thrust manipulation, high-voltage pulse galvanic stimulation (HVPGS), bracing, ice, exercises, restricted usage of the affected elbow, compared to ultrasound, brace, and putty therapeutic exercise.

METHODS: Participants were recruited from a metropolitan area of about 400,000 residents using fliers and advertisements in a free weekly newspaper from May 5th through June 24th, 2008. The primary complaint was lateral epicondylitis (CLE) with duration of pain at least 6 months. Participants were enrolled if they met the diagnostic, inclusion and exclusion criteria. Treatment occurred at the Palmer Center for Chiropractic Research Clinic. Primary Outcome measurements were the Patient Rated Forearm Evaluation Questionnaire (PRFEQ) currently called the Patient-Rated Tennis Elbow Evaluation (PRTEE), and pain free grip strength (PFG). Secondary outcome measures were overall VAS pain scale during past 24 hours (VAS_24).

RESULTS: Ten participants were screened by telephone. 1 was excluded, 1 was no-call, no-show. were examined at the 1st baseline visit. Of eight participants, two failed to attend the 2nd baseline visit for unknown reasons. One participant was excluded at the case review, five were enrolled after the case review, and four successfully completed the treatment protocols.

CONCLUSION: Designing a deliverable successful feasibility RCT study requires considerable planning. Our attempt was to develop and test protocols for an RCT of combined multimodal therapies in a specific sequence for chronic tennis elbow using PRTEE and PFG as the primary outcome measures, and compared to the conventional conservative treatment represented as a sham, or inactive treatment protocol. This is the first attempt of such in a chiropractic college research center, and demonstrates it is possible. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

A Proposed Protocol for Basic Hand and Table Hygiene in Chiropractic Practice

Michael Ramcharan, Cleveland Chiropractic College **Marion W. Evans Jr**, Cleveland Chiropractic College, **Kara Burnham**, Western States Chiropractic College

INTRODUCTION: By nature chiropractic is a hands-on profession involving patients lying on a vinyl table in a prone position with their face and hands in contact with the table. As a result of this mode of treatment, these tables can serve as reservoirs for microbial pathogens. The intent of this paper is to inform the busy practitioner of the presence of microbial pathogens that are evident on treatment tables and create a proposed guideline for hand and treatment table surface sanitizing that is evidence-based and can easily be adopted by teaching institutions and doctors in the field.

METHODS: A review of the literature demonstrated that pathogenic microbes are present on treatment tables in teaching clinics at multiple facilities yet no standardized protocols exist in the United States regarding table sanitizing and hand hygiene in chiropractic clinics or education institutions.

RESULTS: The literature has several existing guidelines which the authors utilized to develop a proposed protocol for hand and table sanitizing specific to the chiropractic profession. When sufficient cleaning and disinfection protocols have not been implemented in a healthcare environment, the bacterial load on treatment tables increases. Practitioners need to adhere to a proposed protocol to reduce the risk of infection for both clinical personal and patients in chiropractic facilities.

CONCLUSION: Proper hand hygiene and table sanitizing is recognized as the leading measure and the single most effective means to prevent, control and reduce the incidence of healthcare related infections. With the increasing prevalence of troublesome infections on the horizon, the chiropractic profession should adopt these or similar measures and disseminate them to teaching clinics, institutions, and private practitioners as soon as possible reduce the incidence rate of office acquired infections. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

A Study to Investigate the Effectiveness of a Disinfection Process being used on Tables in the Labs in the Academic Center of a Chiropractic College

Paula Robinson, **Georgina Pearson**, **Tracy Stark**, **Gene Giggleman**, **Ronald Rupert**, Parker College of Chiropractic

BACKGROUND: It has been demonstrated that both cloth and vinyl technique tables can be contaminated by microbes, including antibiotic resistant bacteria. The Academic Center of Parker College instituted a disinfection process in May 2008 to be used on the technique and diagnosis tables in the teaching labs. This study was performed in July 2008 to investigate the effectiveness of this new process by testing for the presence of microbial contamination after the tables had been regularly disinfected since the implementation of the process.

METHODS: Approximately 15% of the tables in the adjusting and diagnosis labs, chosen at random, were sampled for microbial contamination. The headpieces, the hand rests and the face paper rod were sampled if present. Samples were cultured on both EMB and MSA agar plates. The plates were incubated for 48 hours at 37°C to determine if growth was present. Colonies that showed growth on MSA plates suggestive of the presence of Staphylococcus aureus were cultured to determine if these were antibiotic resistant.

RESULTS: Pathogenic microbes were found to be present on the vinyl tables in the adjusting and diagnosis labs, even though disinfection procedures had been instituted for these tables. A variety of microbial contaminants including gram negative enteric bacteria and antibiotic resistant organisms were isolated.

CONCLUSION: The disinfection procedure being used was not effective in removing all microbial contamination. The possible causes of this finding include the disinfectant being ineffective, the process not being performed correctly or a problem with compliance. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Resolution of Traumatic Cervical Radiculopathy with Chiropractic Care: A Case Report

Steven Roffers, **Kathryn Hoiriis**, **James Duffy**, Life University, College of Chiropractic

OBJECTIVE: This case report describes a woman with traumatic cervical radiculopathy which was treated conservatively with chiropractic care and spinal hygiene exercises resulting in complete resolution of her radicular symptoms.

CLINICAL FEATURES: A 23 year old female developed right C8 radiculopathy within 3 weeks of jumping from a second story window in order to avoid bullets being shot at her during a home invasion robbery. Although the patient did not lose consciousness, she was transported via ambulance to the metropolitan trauma center where she was stabilized and received cervical spine and maxillofacial CT scans. She was treated conservatively with chiropractic adjustments and spinal hygiene exercises. She denied the use of any non-steroidal anti-inflammatory drugs.

INTERVENTION AND OUTCOME: Her C8 radicular symptoms resolved after 8 chiropractic adjustments over a period of 4 weeks. One year after the patient's traumatic event, she remains without radicular symptoms.

CONCLUSION: This case describes an unusual presentation, evaluation, diagnosis, and chiropractic treatment of trauma-induced C8 radiculopathy in a young female who was treated conservatively with chiropractic care and spinal hygiene exercises resulting in complete resolution of radicular symptoms. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Preceptor Doctors' Perception of the Skills of Chiropractic Interns

Kevin Rose, **Michael Sackett**, Southern California University of Health Sciences

INTRODUCTION: In many states it is legal for students to work under a private practitioner's license while completing their chiropractic education. The Los Angeles College of Chiropractic requires all interns to spend part of their internship working in private chiropractic clinics. The goal of this program is to introduce interns to business and practice management skills that are not easily replicated in the college and community clinic settings where chiropractic students typically spend their internship. A survey was conducted to determine what the private practitioners in this program perceive to be the strengths and weaknesses of LACC interns.

METHODS: A self generated survey was mailed to 191 chiropractors who had participated in the LACC preceptorship program during the prior two years. The survey contained a combination of open- and closed-ended questions inquiring about the perceived strengths and weaknesses of interns.

RESULTS: The response rate for the survey was 30.4%. The interns were perceived as being strong in diagnostic and treatment skills, particularly PT/rehab, examinations, diagnosis, history taking and wellness advice. The chief exception was chiropractic technique, which was the most cited weakness. Other perceived weaknesses were mostly related to business skills, including practice management, communication/interaction with patients, patient management, dealing with insurance companies and marketing. X-rays were commonly cited both as an intern strength and weakness, which probably reflects differing opinions among chiropractors on the proper use of radiography in chiropractic practice.

DISCUSSION: The results of this survey helped confirm the importance of the LACC private practice program as interns were perceived as being weakest in skills that are difficult to teach in academic settings. Future research should inquire into the effectiveness of this educational program and ways to improve the teaching ability of private practitioners. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Chiropractic Student Attitudes Toward Physiotherapy

Robert Rowell, **Dana Lawrence**, Palmer College of Chiropractic

INTRODUCTION: There are differing opinions on the role of physiotherapy in chiropractic. Chiropractic students are not isolated from this debate and their opinions represent the future opinions of the profession. This study reports on a survey of chiropractic student attitudes toward physiotherapy in the Palmer College of Chiropractic (PCC) curriculum and in student's future practices. We divided physiotherapy into active care, modalities, and ice and/or heat. Active care was defined as stretching, exercises, proprioception, posture retraining, motor pattern assessment and correction; modalities were defined as ultrasound, electrical muscle stimulation, and laser.

METHODS: A self-report questionnaire was developed. Responses were on a Likert scale ranging from 0 to 5, anchored with the qualifiers: Strongly Disagree (0) and Strongly Agree (5). Demographic data consisting of age, race, gender, and highest level of education prior to matriculating into chiropractic school was also gathered. The survey was conducted both prior to students taking the 1st PT course (Pre-PT survey) and again after completing the 2nd course (Post-PT survey).

RESULTS: We collected 127 Pre-PT and 60 Post-PT questionnaires. Mean age of respondents, percentage of males and females, and race was similar for the 2 groups.

DISCUSSION: From our data we can note the majority of PCC students in both cohorts expressed favorable opinions regarding all the aspects of physiotherapy that we queried.

Students responded favorably about using all forms in the student clinic, outpatient clinic, and in their future practice. Only a small percent of students strongly disagreed with the use of physiotherapy in practice. Students were also favorably disposed to the teaching of physiotherapy in the college curriculum.

CONCLUSION: The majority of PCC students surveyed held favorable attitudes toward the use of physiotherapy. The percentages were similar to those of chiropractors using physiotherapy in practice as reported by the NBCE. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Academic Support in a Chiropractic Setting

Lisa Rubin, Life University

BACKGROUND: The University has incorporated Supplemental Instruction (SI) as an academic support program to compliment traditional tutoring. This enables the University to offer a more diversified academic support program for all students. SI focuses on classes with historically higher failure rates. Classes that are more difficult found mean final course grades to be higher for SI participants than non-SI participants. This paper examines the effectiveness of the SI program in enhancing student academic performance on one chiropractic campus.

OBJECTIVE: This paper looks at academic support services in a chiropractic setting compared to national norms and other chiropractic schools. It looks at how participation in SI can contribute to earning higher grades than those students that did not participate.

METHODS: The four areas in which data was collected are SI vs. Non-SI participant's overall grades, SI student evaluations, SI training evaluations, and an E-mail survey requesting academic support information from other chiropractic schools.

RESULTS: This University tracked the SI data to determine whether it is consistent with the national statistics, which state that SI participants have a higher mean grade in the course than Non-SI students. From Fall 2005 to Summer 2007, in the majority of SI courses covered, SI participants performed better than Non-SI students. Between 68–75% of students participating in SI courses performed better than Non-SI participants.

CONCLUSION: This paper shows that the SI program brings to our campus a way to enhance academic performance, especially in classes that are historically the most challenging, and is an added benefit to traditional tutoring. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Evaluation of Lumbar Lordosis With and Without High-heeled Shoes

Brent Russell, **Kimberly Muhlenkamp**, **Kathryn Hoiriis**, **Ekaterina Malakhova**, Life University

INTRODUCTION: It seems to be a common belief that wearing high-heeled shoes causes an increased lumbar lordosis, and this increased curve is sometimes blamed as a cause of low back pain. Most studies have found either a decreased lordosis or no significant difference with heels. However, some questionable methods and small participant samples have left uncertainties.

METHODS: We recruited 25 university students, staff, and faculty, both men and women, and used a Spinal Mouse to scan each participant's sagittal spinal contours without shoes; then again while they wore 7.5 cm high-heeled shoes following performance of a ten-minute adaptation exercise while wearing the shoes. Our project was approved by the Life University Institutional Review Board.

RESULTS: Four participants were excluded (due either to equipment malfunction, measurement inconsistency, or lumbar kyphosis). Of the remaining 21 participants, most showed no significant change. Two experienced a statistically significant decreased lordosis with high-heeled shoes; only one had a significant increase.

DISCUSSION: There are a few limitations. Our scans began at C7 and ended at S2, instead of the manufacturer's recommended ending point of S3, and this may have contributed to some inaccurate software interpretation of locations and sacral angle measurement. There could be some question as to whether our ten-minute adaptation period was adequate, but previous studies have not shown that the time of adaptation makes any difference. And our sample size was too small for reliable description of group characteristics. In future work we will look for differences between participants: men vs. women, younger vs. older, frequent vs. infrequent wearers, and experienced vs. inexperienced, and will also use surface electromyography to evaluate spinal muscle function.

CONCLUSIONS: It appears that most participants do not experience increased lumbar lordosis with high-heeled shoes.

We will refine our methods and issue a final report later. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

The Conservative Treatment of a Pregnant, Athletically Active Female with a Common Fibular Entrapment Neuropathy

Sandy Sajko, **Andrew Miners**, Canadian Memorial Chiropractic College

BACKGROUND: Peripheral entrapment neuropathies of the lower extremity are a relatively common clinical occurrence. Of the various conditions described in the literature, entrapment of the common fibular nerve (CFN) and/or its terminal branches is the most common. However, calling the diagnosis based on information obtained solely from the patient history and physical exam is a challenging task. The following article discusses the diagnosis and treatment of an athletic female patient who presented to a chiropractic practice for conservative management of symptoms arising from a bout of acute mechanical low back pain and an isolated CFN entrapment neuropathy.

CASE PRESENTATION: A 34-year-old female with 9 years of competitive ice hockey playing experience at the international level had a severe episode of acute low back pain (LBP) without radiation. The patient did report a mild paresthesia along the lateral aspect of the left lower leg. The patient reported the pain in the low back as an 8/10. Her Oswestry Back Disability Index score was 13 out of 50 or 26% indicating moderate disability. A general systems review revealed that the patient was 8 weeks pregnant. The patient was diagnosed with acute non-specific mechanical low back pain, and a left common fibular nerve entrapment neuropathy. The patient was prescribed a treatment program of 3 sessions a week for 3 consecutive weeks, which included spinal manipulative therapy, general core stabilizing exercises, and various soft tissue therapies including active myofascial release, Graston Technique, Vibromax Therapeutics, and nerve flossing. At follow-up, the patient was pain free and had full function.

CONCLUSION: The conservative management approach to CF entrapment neuropathies is poorly documented in the literature. However, soft tissue therapy techniques combined with nerve flossing appeared to help alleviate this patients CFN entrapment neuropathy, whereas spinal manipulative therapy and spine stability exercises appeared to manage the pain and disability associated with an acute bout of mechanical low back pain. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Anatomical Variation of the Suprascapular Ligament in 68 year old male: Implication to Chiropractic Practice

Bahram Sardarabadi, Parker College of Chiropractic

BACKGROUND: Aatomical abnormalities have the potential of causing symptoms that may mimic spinal problems related to disc pathology and nerve compression.

METHODS AND RESULTS: During a routine right shoulder dissection, an unknown ligament was found. The ligament was located just inferior to the suprascapular nerve at the suprascapular notch. This ligament appeared to be free of any attachment to the surrounding structures except the walls of the suprascapular notch. X-Ray of the right scapula showed the suprascapular notch to be larger than average. Suprascapular notch measurements vary from 21 mm to 27.8 mm deep. The suprascapular notch measurement was 21 mm deep. Measurement of the inferior ligament from distal to the proximal end is 4 mm to 6 mm. The length also was measured and it was11 mm long, and 5.5 mm inferior to the suprascapular ligament. Dissection of the left shoulder of the same cadaver revealed a smaller transverse ligament just inferior to the suprascapular nerve. This ligament is more membranous in nature and measured to be just 4.2 mm wide and 11 mm long. Subsequently 22 pairs of shoulders were dissected (12 male and 10 female) and none presented such a structure. This structural arrangement has never been identified at our institution. A review of the literature located only two references to the inferior transverse ligament of the scapula. Ide reported that this ligament can be membranous in nature (60%), and ligamentous in about 21%. Our observation confirms that the inferior transverse ligament in our specimen to be ligamentous in nature. Further review of the literature failed to find any other references to this ligament even during corrective shoulder surgeries.

CONCLUSIONS: Chiropractors see a significant percent of peripheral neuritis, neuralgia, or neuropathy (69.5%) and based upon the potential of this anatomical variation in the shoulder to produce such symptoms, it is important to be familiar with the existence with this rare but potentially clinically significant anatomical variation. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Chiropractic Institutional Collaboration with Veterans Administration to Implement a Randomized Clinical Trial: A Pilot Study

Craig Schulz, Northwestern Health Sciences University, **Howard Fink**, Veterans Administration Medical Center, **Gert Bronfort**, Northwestern Health Sciences University

INTRODUCTION: Chiropractic institutional affiliation with the Minneapolis VAMC was established to conduct a pilot study comparing exercise versus exercise plus chiropractic therapy in veterans with chronic low back pain. We aim to describe the collaboration process between these institutions with no prior research relationship.

METHODS: Study activities occur at the Minneapolis VAMC and at the Wolfe-Harris Center for Clinical Studies (WHCCS) at Northwestern Health Sciences University. All study recruitment, eligibility assessment, and outcomes data collection occur at the Minneapolis VAMC. All study-related treatments occur at WHCCS. The planning and start up phase occurred over an eight month period. The first months focused on protocol development and training of personnel. The later months focused on further training and development of investigator relationships with internal Minneapolis VAMC health care specialties.

RESULTS: Clearly defined study site and personnel-specific responsibilities have enhanced planning and communication efficiency. Web-based phone screening and data entry systems streamline project and data management and also provide easy and secure access to data across sites.

DISCUSSION: The pilot study addresses logistical challenges inherent in coordinating a multi-site RCT. Challenges can be categorized as administrative, methodological, and clinical. All types of challenges incurred with this collaboration were most effectively handled with more (versus less) communication through all available means.

CONCLUSION: Development of institutional collaborations requires frequent and open communication. The likelihood of success is increased if investigators are patient and open to new ideas and approaches. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Mechanical vs Manual Manipulation for Low Back Pain Purpose and Study Design: Prospective cohort study to Explore the Clinical Treatment Effect of Mechanical vs Manual Manipulation for Acute Low Back Pain

Michael Schneider, University of Pittsburgh

METHODS: A total of 92 patients with a history of low back pain of less than 12 weeks duration were recruited from three private chiropractic offices. Two of these offices utilized side posture manual lumbar manipulation (Diversified) as their primary mode of manual treatment, and the third office exclusively used the Activator Instrument for mechanical assisted lumbar manipulation. The attending chiropractors used a "treatment as usual" protocol with the participants for a maximum of eight visits or four weeks, which ever occurred first. Primary and secondary outcome measures were the differences in pain and Oswestry scores from baseline to four weeks, respectively. The two cohorts were also analyzed with respect to their clinical practice patterns, utilization of adjunctive modalities, and treatment expectations.

RESULTS: Socio-demographic characteristics of the two cohorts were analyzed at baseline and not found to show any significant differences between the groups except for age. The Activator cohort had a significantly higher utilization of adjunctive modalities and x-rays, with a mean number of office visits about twice that of the manual manipulation cohort at four weeks. Expectation of treatment effectiveness was highly correlated with pain reduction in both cohorts, however there were significant differences in beliefs and expectations about mechanical and manual manipulation methods between the two groups. The pain scores were lowered in both groups, however the manual manipulation group showed a significantly greater amount of pain score difference at four weeks after controlling for baseline pain. The manual manipulation group also showed a slightly greater reduction in Oswestry scores from baseline to four-weeks, this difference was not statistically significant.

CONCLUSIONS: There was a greater reduction in pain scores within the manipulation group, but no significant difference in the Oswestry scores at four weeks. This study provides important pilot data and and discusses research issues for the design of a future randomized clinical trial that can control for these issues of confounding. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

AIR S&M: Transforming PARTS into a Segmental Dysfunction Analysis System

Paul Sherman, **Christopher Good**, University of Bridgeport College of Chiropractic

INTRODUCTION: Managing segmental dysfunction (SD) involves two distinct processes: analysis and treatment. A multi-method analysis known as PARTS (pain, asymmetry, range of motion, tone, temperature, texture, and special tests) is often utilized for patient care and third-party reimbursements, but it lacks organization. A system was developed at the University of Bridgeport College of Chiropractic named AIR S & M (ask, inspect, range of motion, static and motion palpation) that standardized patient assessment and was based on a "least invasive" format. This paper describes the development of this system and reports the findings of our student survey.

METHODS: The process begins with four history questions identifying areas of pain or new clinical conditions. It is the "A" component of AIR S & M. Inspection ("I") uses the acronym DASEDD to identify discoloration, abrasions, scars, edema, deformities and distortions. Range of motion testing ("R") combines active and then passive ROM. Static palpation ("S") consists of soft tissue (the 4 Ts: tone, temperature, texture and tenderness) and bony palpation (MALT: misalignment, anomalies, landmarks and tenderness). Motion palpation ("M") includes a general scan and accessory motion palpation for joint play/endfeel. A student questionnaire was developed, tabulated and analyzed for feedback and quality improvements.

DISCUSSION: AIR S & M provides data meeting the PARTS criteria for SD analysis. Student perceptions were that AIR S & M was extremely useful for analyzing SD. They welcomed this to their technique education because it sharpened and organized their clinical thoughts and increased their confidence levels. They also felt adoption of it by the profession could establish a universal assessment procedure for identifying SD.

CONCLUSION: AIR S & M provides a safe and systematic method to analyze SD by incorporating the components of the PARTS model. Quality clinical notes that aid third party reimbursement can be created. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Experiental Learning: A Game on Aging to Improve Quality of Care

Jodell Skaufel, **Cara Borggren**, **Michael Wiles**, Northwestern Health Sciences University

INTRODUCTION: Ageism is silently prevalent within our society. Biases and misconceptions can impact not only the willingness to serve the geriatric population but can also affect the therapeutic relationship between doctor and patient. One key to addressing ageism is by creating awareness and empathy through education. While instructive, traditional lecture style has its limitations in developing understanding and empathy, actual experience better translates the significance to a deeper personal level. Other health care providers have used an aging game as a simulation tool, mimicking general daily living experiences. None to our knowledge simulate a clinical encounter.

OBJECTIVE: To create a simulated aging experience within a mock chiropractic clinical encounter and determine its effects on students' attitudes towards the elderly. The purpose of the experience was to create a greater empathy and appreciation of the aging process, and thereby influence the desirability to serve this growing population.

METHODS: Descriptive data were gathered on the participants. To evaluate the effectiveness of this experience, a pre and post survey was administered, and inferential data was then computed from the collected numbers. This study was approved by the Institutional Review Board and qualified as Category I: Investigational Strategies in Educational Setting.

RESULTS: The results demonstrated a statistically significant improvement in empathy toward the elderly as well as an increase in interest in treating the aged.

DISCUSSION: Discussion includes an evaluation of the experience as simulation in a classroom setting to inspire change, the evaluation of the game and post hoc data in determining modification of the experience, and the use of such data in the development of further studies.

CONCLUSION: The results of the game support the use of a simulated game within the classroom setting as a tool for challenging ageism, improving attitudes and thus enhancing care. Further studies will further explore its potential. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

A Pilot Study of the Effects of Acupuncture on Blood Pressure and Heart Rate Variability in Normotensive and Mild to Moderately Hypertensive Participants

Brian Snyder, **John Zhang**, **Rodger Tepe**, Logan College of Chiropractic

INTRODUCTION: The specific aim of this study was to test the effectiveness of needle acupuncture on blood pressure (BP) and heart rate variability (HRV) in normotensive and mild to moderately hypertensive participants.

METHODS: This pilot study was a prospective, single blind (participants), randomized, sham-controlled parallel-group clinical trial. Approval was obtained from the Logan College of Chiropractic Institutional Review Board. A convenience sample of 30 consenting normotensive and mild to moderately hypertensive participants were assigned by simple randomization into traditional Chinese acupuncture and sham acupuncture groups. Both groups received treatment twice per week for four weeks. Blood Pressure and HRV measurements were taken one week before the first treatment and immediately after the 2nd, 4th, 6th and 8th treatments.

RESULTS: Twenty-seven subjects completed the study. Three volunteers consented to participate but did show for the trial. No adverse events were reported. Data analysis by one-way repeated measures ANOVA showed significant reductions ($p < 0.01$) in systolic and diastolic BP between the first and last measurements for both the traditional Chinese acupuncture and the sham acupuncture groups. There were no changes in HRV.

CONCLUSION: In this study both traditional Chinese acupuncture and sham acupuncture resulted in significant reductions in systolic and diastolic blood pressure. There were no changes in heart rate variability. Further study should investigate the effects of acupuncture on larger samples of hypertensive participants. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Non-Uniform Psoas Deformation Under Tensile Load Corresponds to Superficial Dense Connective Tissue Morphology

Guy Sovak, **Frances LeBlanc**, **John Triano**, **Steve Tran**, Canadian Memorial Chiropractic College

INTRODUCTION: Manual therapy loads are attenuated by soft tissue deformation and active muscle resistance. The psoas is one structure that may be loaded during manipulation. Recent work on the transfer of uniaxial tension through isolated psoas muscle shows non-uniform, differential tri-axial deformation related to the aponeurosis. This study examined related morphological features.

MATERIAL AND METHODS: Frozen (-70°C) porcine psoas muscles (10) were sectioned into approximately 3 (α, β, γ) segments. Each surface was photographed (Nikon 8700). Digitization of fascial landmarks and cross-sectional areas were obtained using JMicroVision v1.2.7 (NIH) image analysis software.

RESULTS: Little variation of weight (2.8N $\pm$ 0.7) or length (30.98 Cms. $\pm$ 1.78) was observed. The aponeurosis overlay one-quarter diameter of muscle for 10.28 Cms $\pm$ 2.18 and was significantly correlated (r=0.71) with muscle length but not mass. Total area ranged between 15.94 Cms2 $\pm$ 3.94 for 'α', $\pm$', 16.64 Cm2 $\pm$ 4.32 for 'β', and 16.0 Cm2 $\pm$ 4.06 at 'γ'. Percentage area for fascia 'α' was the largest (3.07% $\pm$ 1.05). 'β' was 1.43% $\pm$ 0.62 and the smallest was plane 'γ' with 0.04% $\pm$ 0.06. The percentage of septal area fluctuated between 2.81% $\pm$ 1.57 ('α'), 1.91 % $\pm$ 1.03 ('β') and 2.4% $\pm$ 1.3 ('γ'). Aponeurosis across sections revealed significant differences between the planes (α-β plane $p = 0.004$; α-γ plane < 0.0001; β-γ plane $= 0.0001$). There was no significant difference between the septal areas (α-β plane $p = 0.14$; α-γ plane 0.75; β-γ plane 0.45).

CONCLUSIONS: Simple models of muscle acting as series elastic elements are inadequate even for a relatively homogeneous muscle. The location and density of even a small amount of CT corresponds to functional deformation and strain in our parallel work. How the muscle inserts into bone, by focused tendon attachment or by distributed periosteal insertion may influence joint function. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Chiropractic Care During and After Pregnancy: A Survey of Women's Attitudes

Catherine Stephens, **Christina Cunliffe**, **Ian Johnson**, McTimoney College of Chiropractic

BACKGROUND: While acceptance and use of chiropractic is increasing generally, there is little information on its use by subgroups who may require special information to make informed choices about their healthcare. There are published

studies that have reported the attitudes, awareness and use of chiropractic by patients and public. However none have been found that investigate solely the attitudes and awareness of chiropractic treatment in pregnant women and women with infants.

OBJECTIVES: To examine the attitudes and awareness of women towards chiropractic treatment during, and after, pregnancy

METHODS: After obtaining the necessary permissions and a pilot study, 107 questionnaires were distributed using convenience sampling and completed during parent and toddler sessions by women who were either pregnant or had a child under 5.

RESULTS: All questionnaires were returned and usable. Respondents were generally unable to indicate an attitude towards the safety and efficacy of chiropractic during pregnancy, with most respondents (51%) neutral on this point. Fewer respondents were aware of the safety and efficacy of chiropractic in children. 41% were neutral when asked if they considered chiropractic unsafe for children although 33% disagreed. The most frequent conditions reported during pregnancy were low back pain (61%) and headache (31%). Reporting of conditions to healthcare providers was generally high. Despite respondents stating a high level of experience of chiropractic and awareness of conditions chiropractors can treat, few chose chiropractic treatment during pregnancy.

CONCLUSION: This study shows a discrepancy between patients' awareness of chiropractic and their experience of chiropractic and may indicate a need for a reassessment of current patient and healthcare provider education about chiropractic during and after pregnancy. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Use of Extension-rotation Testing to Screen for Vertebral Artery Dissection by Canadian Chiropractors

Kent Stuber, **Kimberley Wittner**, Canadian Chiropractic Examining Board

INTRODUCTION: Cervical extension-rotation (C-ER) tests have questionable usefulness as a screening tool for vertebrobasilar artery insufficiency (VBI). The purpose of this study was to determine the frequency of C-ER test use and if their use or lack of use was dependent upon any of a variety of clinician- or clinically-related variables.

METHODS: An 89 question online survey approved by the CCEB Research Ethics Committee was conducted on 1000 Canadian chiropractors selected using a random sampling method, stratified by jurisdiction. Topics included doctor and patient demographics, clinic procedures and patient management, and conditions seen. Descriptive statistics were reported and associations between the use or lack of use of C-ER testing and various demographic and clinical practice variables were sought with significance set at the 5% level using the chi square test.

RESULTS: A 23% response rate (n = 230) was obtained. 38.3% of respondents indicated "never" using C-ER tests to screen new patients for VBI, whereas 61.7% indicated using them on at least some new patients. All of the practitioner demographic and clinical variables were found to be independent of whether or not respondents employ C-ER tests.

DISCUSSION: To our knowledge this is the first study that has documented the current usage of C-ER tests as a screening tool for VBI among Canadian chiropractors. The results are important as they indicate the regularity with which C-ER testing is employed and that there was no identifying demographic or clinical variable that would indicate whether or not those surveyed employ these tests.

CONCLUSION: There appears to be regular use of C-ER testing as a screening tool for VBI. Chiropractic educational institutions and organizations should make greater attempts to educate students and practitioners about use of these tests. Further study into the tests and their use in clinical practice is warranted. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Conservative Treatments for Lumbar Spinal Stenosis: A Systematic Review of Randomized Controlled Trials

Kent Stuber, private practice, **Sandy Sajko**, Canadian Memorial Chiropractic College, **Kevyn Kristmanson**, private practice

INTRODUCTION: Lumbar spinal stenosis (LSS) is a common and disabling condition. Non-surgical therapies are generally recommended prior to surgery. The purpose of this study was to systematically review the literature for randomized controlled trials regarding the conservative treatment of LSS in comparison with surgery and other conservative interventions.

METHODS: A multimodal search strategy was conducted using multiple databases and reference searching. Included studies were limited to RCTs involving conservative treatments for LSS published in English between January 1983 and July 2008. Included articles were independently rated for quality by three reviewers using the Jadad scoring checklist.

RESULTS: Six studies were included and all scored three out of five for quality. Two compared non-surgical interventions, the remainder compared surgery against non-surgical treatment. All of the studies utilized exercise, otherwise treatments in non-surgical groups varied, as did outcome measure use and follow-up. Surgery outperformed non-surgical care each time they were compared. Manual therapy with supported treadmill walking and general exercise outperformed flexion exercises, unsupported treadmill walking and subtherapeutic ultrasound.

DISCUSSION: This is believed to be the first systematic review that solely evaluates the literature on conservative treatments for LSS. Despite the more favorable results for surgery over non-surgical care, some authors opine that a non-surgical trial of therapy is warranted before surgery although there is no clearly indicated non-surgical treatment. The Jadad scoring system was unable to discriminate between higher and lower quality RCTs. Future research should include well designed RCTs comparing different conservative treatments to help determine which interventions to compare with surgery. Chiropractic care has shown promise in preliminary research.

CONCLUSION: Surgical treatment for LSS appears to have better short and long term outcomes when compared with non-surgical treatment. Non-surgical interventions appear to produce improvements and should likely still be considered as a trial of therapy before surgery. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Spinal Manipulation Alters Central Integration Of Dual Somatosensory Input Observed Following Motor Training

Heidi Taylor, New Zealand College of Chiropractic, **Bernadette Murphy**, University of Ontario Institute of Technology

INTRODUCTION: The presence of spinal dysfunction may represent one factor that could induce maladaptive central plastic changes. This study sought to investigate the influence of spinal dysfunction and spinal manipulation on the response of the CNS to a motor training task.

METHODS: The dual peripheral nerve stimulation somatosensory evoked potential (SEP) ratio technique was utilized in eleven subjects before and after a 20 minute typing task and again when the typing task was preceded with cervical spine manipulation. SEPs were recorded following median and ulnar nerve stimulation at the wrist (1 ms square wave pulse, 2.47 Hz, 1 $\times$ motor threshold). SEP ratios were calculated for the N9, N11, N13, P14–18, N20-P25 and P22-N30 peak complexes from SEP amplitudes obtained from simultaneous median and ulnar (MU) stimulation divided by the arithmetic sum of SEPs obtained from individual stimulation of the median (M) and ulnar (U) nerves.

RESULTS: There was a significant increase in the MU/M+U ratio for both cortical (ie, N20-P25 and P22-N30) SEP components following the 20 minute repetitive contraction task. This did not occur when the motor training task was preceded with spinal manipulation. Instead there was a significant decrease in the MU/M+U ratio for the cortical P22-N30 SEP component. The ratio changes appear to be due to changes in the ability to suppress the dual input as concurrent changes in the MU amplitudes were observed.

DISCUSSION: This study suggests that cervical spine manipulation not only alters cortical integration of dual somatosensory input, as previously reported, but also alters the way the CNS responds to subsequent motor training tasks.

CONCLUSION: These findings may help to elucidate the mechanisms responsible for the effective relief of pain and restoration of functional ability documented following spinal manipulation, and may help to elucidate the mechanism involved in the initiation of overuse injuries. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

How the Index to Chiropractic Literature Contributes to Chiropractic Education and Practice Worldwide

Anne Taylor-Vaisey, Canadian Memorial Chiropractic College, **Phyllis Harvey**, Palmer College of Chiropractic

PURPOSE: To determine how and to what extent the Index to Chiropractic Literature (ICL) enables people around the world to learn about chiropractic by accessing citations and/or abstracts for peer-reviewed articles from the chiropractic journals.

BACKGROUND: The primary goal of the ICL is to provide cover-to-cover indexing of peer-reviewed literature from chiropractic publishers. The current project explores how people reach ICL through many sources, including search engines, numbers of users and their geographic and Internet origins, and what they search for once they reach ICL.

METHODS: We examined the site statistics for 2008 using SmarterStats Professional Edition 3.3.2693. SmarterStats provides standard reports such as numbers and geographic origin of visitors, hits and page views, top pages and files, browsers used and referring URLs. In addition to

these reports, we wanted to know what users actually type in ICL's search boxes, and SmarterStats provides data mining tools that provide this information.

DISCUSSION: We expected the U.S. and Canada to be ICL's heaviest users, but were surprised by the large numbers of hits from many other countries. The presence of many non-English Google referring sites indicates that placing links to records on ICL's "What's New" page makes the contents of the database available to people who likely did not know about ICL but reached it through search engines. The fact that ICL has no subscription fees or registration requirements increases its availability. An analysis of the searches performed in /index.php tells us what topics and journals are of most interest as well as how users search.

CONCLUSIONS: Traffic on ICL is heavy and a large variety of searches are performed. Overall the statistics indicate that ICL's population of users is large and geographically diverse, and that this high quality, free bibliographic database is serving its users well. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Fascia Dependent, Tri-Axial Deformation and Strain of Psoas Under Manipulation Preload Conditions

John Triano, Canadian Memorial Chiropractic College & McMaster University, **Guy Sovak**, **Edward Cambridge**, **David Torrance**, **Steve Tran**, Canadian Memorial Chiropractic College

INTRODUCTION: The effective details of mechanotransduction from manual treatments to altered function are obscured by the dissipation of treatment loads as tissues deform. This study evaluated muscle deformation and strain under simple tensile load.

METHODS: Qualitative and quantitative measures of macroscopic muscle behaviour to passive stretch were performed. A Mcmesin (West Sussex, England) testing system provided tensile load (8.33 mm/sec; 30% muscle length). Muscle morphology and behaviour to passive stretch was monitored by orthogonal photography and ultrasound elastography. Acupuncture needles marked the terminus of surface aponeurosis and at 2 cm intervals on either side. Changes in surface dimensions, marker displacements, needle angular deviations, estimates of interval strains and Poisson's ratios were calculated. Internal muscle substance displacement was evaluated by ultrasound (Sonix RP, Burnaby, BC).

RESULTS: Muscle samples averaged 17.43 ± 1.0 cm in length and midsubstance diameters of 5.03 ± 0.56 cm. Needle bending differed according to location of surface aponeurosis presence ($p=0.0011$). Sectioning the aponeurosis reduced the difference. The overall mean Poisson's ratio for side-to-side deformation was minus 0.365 ± 0.182 while the upper-to-lower ratio was $+0.473 \pm 0.126$ ($p < 0.0000$). Intramuscular deformation reflected similar anisotropic responses to elongation. Constant rate elongation was associated with non-uniform distribution of displacement and strain across the psoas depth and length, related to aponeurosis presence.

CONCLUSION: Deformation is not uniform under simple tensile load and is altered by the presence or absence of surface connective tissue. Future study will need to examine in situ effects and the influence of surrounding tissues on load distributions. These findings emphasize the need for information on local distribution of loads in order to unravel mechanotransduction mechanisms that link environmental and treatment forces to health. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Effects of Still Point Inducer on the Autonomic Nervous System

Mary Unger-Boyd, **John Zhang**, **Rodger Tepe**, Logan University

PURPOSE: The purpose of this investigation is to determine the affect of the still point inducer on the autonomic nervous system as evaluated by heart rate variability (HRV). The still point inducer is a device made of latex that can be used by a person to induce a still point. A still point occurs when there is an alteration in craniosacral rhythm. The purpose of this study is to determine if the still point inducer is a valid tool for improving the autonomic nervous system function.

METHODS: The subjects participated in a one-time treatment utilizing the still point inducer or a sham treatment. Heart rate variability measurements were taken pre and post treatment. Fifty-five subjects were randomly assigned into two groups: 28 in the experiment group and 27 in the control group. Nine subjects in each group had received a chiropractic adjustment within 48 hours of the treatment. A T-test was utilized to analyze all data.

RESULTS: Statistical significant difference was found between pre and post treatments for total power in the experiment group (pre - 734 ± 1180, post - 993 ± 1567, $P = 0.011$). After subdividing the groups there was statistical significance between pre and post measures for mean heart rate in the non-adjusted experiment group (pre - 78.8 ± 17.7, post 76.3 ± 17.3, $P = 0.007$) and statistical significance between pre and post measures for total power in the adjusted experiment group (pre - 464 ± 328, post - 812 ± 275, $P = 0.013$).

CONCLUSION: The still point inducer is effective in improving heart rate variable measures after a 10-minute treatment session. This improvement correlates to a more responsive autonomic nervous system. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Comparison of Analytical Techniques for Multiple Endpoints in Clinical Trials

Darcy Vavrek, Western States Community College, **Nancy Temkin**, University of Washington

BACKGROUND: Multiple study endpoints often present such challenges as skewed distributions, high correlation, random missingness, null treatment effects in some of the endpoints, and, in the case of studies of traumatic head injury, high numbers of deaths.

PURPOSE: This paper discusses strategies for analyzing data with multiple endpoints for a positive treatment effect when comparing the treatment group to the placebo group.

METHODS: We explored three kinds of multiple endpoint strategies: testing endpoints individually using a Bonferroni correction (Chi-Square test, Mann-Whitney U test, Student's t-test), creating a composite outcome measure from the multiple endpoints using O'Brien's rank sum method, and incorporating all the intact endpoints into one statistical model (logistic regression, ordinal logistic regression, or linear regression) by using GEE to account for correlation among the endpoints. We used simulation to assess the power of each of these methods under various scenarios of correlation, missingness, null treatment effects, and death rates.

RESULTS: O'Brien's rank sum composite endpoint was the method most robust to high numbers of outcome measures with high correlation, missingness, and a null effect in one or two out of four measures. Logistic regression with GEE was the method most robust to high rates of death among study subjects.

CONCLUSIONS: When the scientific question is regarding a treatment effect across all measures, then O'Brien's rank sum method is robust to the most situations. When interpretability of the results regarding a treatment effect across all measures is critical, then logistic regression with GEE may be the technique of choice. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Simulation Tests for Cervical Non-Organic Signs: A Validation Study

Howard Vernon, **Daniel Proctor**, **Jesse Moreton**, Canadian Memorial Chiropractic College

INTRODUCTION: Cervical non-organic signs (C-NOS) are not as well-established as those for the lumbar spine. Sobel et al. [2000] developed a set of such signs; however, the number of truly cervically-related simulation signs (not symptoms) in this group is limited to one test. Additional simulation tests would be useful in the C-NOS battery.

METHODS: A set of four tests was devised: simulated sitting trunk/shoulder rotation (from Sobel et al.), active vs passive cervical rotation, Libman's test of pressure (PPT) over the mastoid process, and, side-lying passive shoulder abduction. These tests were validated in two samples of subjects, those with and without neck pain. Subjects were asked if the tests provoked or aggravated neck pain (Yes/No) and if they appeared to be appropriate for an examination neck pain (Yes/No). Tests achieving an 85% rating on these two questions were considered valid and potentially useful in future clinical studies. Two other tests included measurements: pressure algometry over the mastoid process, and, angular rotations of the cervical spine.

RESULTS: Results are currently available for the non-neck pain group. None of the tests was painful to more than 10% of the subjects. Only the sitting torso rotation test was not endorsed by more than 90% of subjects as "an appropriate test for neck pain". The mean mastoid PPT was 7.2 (3.3); the lower cut-off was 6 kg/cm2. Passive rotations were 11% and 9% greater than actives, right and left, respectively.

CONCLUSIONS: Data from neck pain subjects will be available shortly. Currently, all four tests appear to be valid as cervical simulation tests, although the sitting torso test, if not endorsed by the pain group may be dropped. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Chiropractic Students and Research: Forecasting Scientific Progress

Kenneth Weber, **Xiaohua He**, Palmer College of Chiropractic Florida

INTRODUCTION: To continue positive professional growth and boost research endeavors, chiropractic institutions need to develop research orientated foundations while striving to generate a larger body of researchers from the current student populace.

PURPOSE: To provide a current analysis of the research culture among students at Palmer College of Chiropractic Florida (PCCF) to make sure enough students are being involved in research to continue to produce a strong pool of researchers. This study will gain insight toward the research contributions of the next generation of chiropractors and identify the difficulties toward participation. This will help modify current academic programs to better foster research and ensure a promising, credible future for the chiropractic profession.

METHODS: Eligible participants were students at PCCF enrolled in quarters 1 through 12 during the 2008 summer term. To evaluate the research culture participants were asked to complete a 33 item web-based survey. All study protocols and procedures were approved by the Palmer College of Chiropractic Institutional Review Board with a minimal risk protocol.

RESULTS: One hundred and eighty-eight students completed the survey. Forty-four percent were female, and the mean age was 26 (SD=3.8). Ninety-nine percent of respondents agreed that research is necessary for positive growth within the chiropractic profession. A majority of students reported having research experience, and 56% plan to participate in research activities prior to graduation. Technical writing was reported as the most challenging aspect of research, and heavy academic workload reported as the greatest deterrent to participation.

CONCLUSION: This study expresses immense possibilities to build a strong research culture at PCCF. Students are aware of the necessity for research and are openly interested in conducting research. Modification of current academic policies will allow for greater student research opportunities and the cultivation of tomorrow's researchers. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Abdominal Muscle Thickness in Post Partum vs Nulliparous Women: A Preliminary Study

Carol Ann Weiss, **John Triano**, **Michelle Campbell**, **Martine Croy**, Canadian Memorial Chiropractic College

INTRODUCTION: The cause of LBP in pregnancy may reflect weakened abdominal musculature. Pain can be debilitating, interfering normal activities. This study compared the post-partum musculature versus nulliparous females using ultrasound.

METHODS: Thirty-six women (30 nulliparous, 6 post-partum < 4 weeks) were examined. Using bony landmarks and standardized tasks to locate muscle sites of interest, images of the external (EO), internal oblique (IO), transverses abdominus (TVA), upper and lower rectus (RA) were obtained with a 60 mm linear transducer (Ultrasonix RP, Ultrasound Medical Corp, Burnaby, BC) at 6 MHz to 14 MHz and depth of 4 to 10 cm. Relaxed transverse thickness was measured digitally. Student's t-tests examined for differences between groups.

RESULTS: Nulliparous women averaged 61.6 kg and 166.6 cm and ranged from 24–32 years while post-partum subjects were 74.9 kg and 170.2 cm and ranged between 26 and 38 years. The mean duration after delivery was 20.8 days. Student's T-tests revealed nulliparous control (mean 26.3, SD=1.39) were significantly younger ($P < 0.001$) than post partum counterparts (32.8 years old, SD=5.45). Postpartum women were heavier ($P < 0.001$). Both the upper RA ($P < 0.0001$) and lower RA ($P < 0.0011$) were thinner (8.25 mm, SD=1.20 mm; 8.49 mm, SD=2.42, respectively) than for the controls (11.62, SD=1.72 and 11.87, SD=2.07, respectively). EO, IO and TVA were not different.

DISCUSSION: While compensatory muscle changes might be expected for all abdominal muscles following pregnancy, only the rectus abdominus was affected. Muscle power is a function of the muscle cross-sectional area. Whether muscular support of the pelvis is compromised by geometric factors or by loss of capacity due to muscular thinning or change in fibre type remains to be determined.

CONCLUSION: Future work should examine the change of cross-sectional area of the RA and develop appropriate biomechanical models to understand the mechanical factors that may prevent/resolve peripartum back pain suffering. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Graphical Analysis and Frequency Distribution of Dysfunctional Motion Segments of the Cervical Spine in the Sagittal Plane

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BACKGROUND: Numerous authors discuss cervical dysfunction producing chronic pain and degeneration. They indicate that such dysfunction can be identified on the sagittal plane radiograph using motion study analysis. Objective: The object of this study was to assess the symmetry of vertebral motion in the sagittal plane from the extremes of flexion and extension as measured from the neutral position.

PURPOSE: The purpose was to identify which motion segments are most commonly dysfunctional, determine the frequency of motion segment instability, describe a mathematical method to determine an adjustment vector and assess the effectiveness of clinical intervention.

METHOD: Five hundred eighty-eight unique and 236 serial cervical motion studies were obtained over a two-year period from a chiropractic practice. Segmental motion from occiput through C7 was determined using a computer-assisted method. Segmental instability was determined applying the definition provided by the AMA Guides, 5th Edition.

RESULTS: In the sample of 588 motion studies occiput was found to be in a position of flexion fixation 88% of the time. C1 was found to be in a position of extension fixation 68% of the time. No other motion segments demonstrated a statistical tendency of fixed flexion or extension dysfunction. Sixty-five percent of the 588 demonstrated motion segment instability. Following clinical intervention sixty eight percent of those with instability no longer demonstrated instability.

DISCUSSION: In this sample population motion segment instability was a common occurrence (65% of the sample) and found in combination with upper cervical dysfunction. This may be attributable to forward head translation and disruption of the cervical curve.

CONCLUSION: This study identified occiput and C1 as the most frequently fixated motion segments. With clinical intervention 68% of those with instability showed improvement. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Develpoment of a Rat Model of Lumbar Facet Joint Inflammation

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INTRODUCTION: Numerous animal models exist for major spinal diseases and lesions, such as disc herniation and sciatic neuropathy. Fewer studies exist on animal models of facet joint inflammation; none have been directed at a range of sensory and motor dysfunction tests; none have reported long-term changes. To address this gap in knowledge we have begun to develop a rat model of lumbar facet joint inflammation.

METHODS: Male Sprague-Dawley rats were anaesthetized with a combination of ketamine (5 mg/100 g) and xylazine (0.5 mg/100 g), i.p. A midline incision was made and the fascia along the right side of the supraspinous ligament was scraped by blunt dissection. The multifidus muscle at the L5 spinous process was similarly resected to expose the L5-L6 facet joint capsule. Complete Freud's adjuvant (2 μL; prepared according to Naeni et al., 2005) was injected to this facet joint. Subsequently the muscle was sutured, and the skin closed using suture clips. In control rats, sterile saline replaced the CFA solution. Tests of sensory function included the von Frey filament test and measurements using an algometer. Tests of motor function included the open field test and a side-to-side progression test. Data were obtained at 1, 3, 7, 14, 21 and 28 days after model induction.

RESULTS: In pilot studies, von Frey filament testing demonstrated the development of tactile hypersensitivity on days 7 through to 21. Pressure algometry demonstrated deep hypersensitivity across the lumbar vertebrae, with the greatest sensitivity at L1. Model animals were able to mobilize voluntarily, and efforts are now being made to determine any motor deficits.

CONCLUSIONS: Preliminary data suggest that this might be a viable animal model of lumbar facet joint inflammation. Further studies are needed documenting a full range of structural and functional changes in this model, and tracked longitudinally to map the time course of these changes. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Effects of Nutritional Supplements on Blood Pressure

John Zhang, **Eric Marsili**, Logan University

INTRODUCTION: The purpose of this study is to determine the effect of nutritional supplements on blood pressure and heart rate variability in hypertensive subjects.

METHODS: The control group consumed 500 mg calcium per day. The second group took 2 serving of NanoProPRP (Whey) a day and the third group received 2 servings of NanoProPRP plus NanoGreens10 (Fruits and vegetables) a day. All subjects were given three months supply of the nutritional supplement. The study was approved by the university IRB.

RESULTS: Thirty-seven subjects were recruited and thirty-two completed the study. Control group has 11 subjects, Whey group had 12 subjects and NanoGreens + Whey group had 9 subjects. Both the systolic and diastolic blood pressure decreased significantly in the Whey and Whey+NanoGreens groups. No significant changes were observed in the control group. The systolic blood pressure decreased from 141.0 ± 11.8 mmHg to 126.6 ± 7.2 mmHg ($P < 0.05$) and the diastolic blood pressure decreased from 92.8 ± 6.2 mmHg to 84.6 ± 9.4 mmHg ($P < 0.05$) in the Whey group. The systolic blood pressure decreased from 136.3 ± 3.1 mmHg to 125.4 ± 5.1 mmHg ($P < 0.05$) and the diastolic blood pressure decreased from 88.5 ± 7.6 mmHg to 74.6 ± 7.7 ($P < 0.05$) mmHg in the Whey+NanoGreens group. No significant blood pressure decrease was observed in the control group ($P > 0.05$). Body weight was increased significantly in the control group from 190.9 ± 20.9 pounds to 196.3 ± 23.3 ($P < 0.05$). The body weight in the Whey group and the Whey+NanoGreens group did not show significant changes ($P > 0.05$).

CONCLUSION: After taking the Whey and Whey+NanoGreens supplement for 90 days, both the systolic and diastolic blood pressures decreased significantly. The body weight was increased in the control group but not in the two treatment groups. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

Green Fruit and Vegetable Mix Powder on Reduction of Oxidative DNA Damage, as Assessed by Urinary 8-Hydroxy-2-Deoxyguanosine

John Zhang, **Rodger Tepe**, **Amy Sau**, **Derek Ng**, Logan University

INTRODUCTION: The purpose of this study is to determine the antioxidant effect of nutritional supplement by using urinary 8-Hydroxy-2-2 deoxyguanosine analysis.

METHODS: Thirty asymptomatic subjects were randomly recruited in one control group and two experimental groups with two different nutritional supplements. Study subjects were given a 30-day supply of the nutritional supplement (fruits and green vegetable mix powder, and Vitamin pills with C, E, Zinc and zeaxanthin). 8-hydroxy-2_-deoxyguanosine (8-OHdG) urine analysis was measure before and after taking the supplements.

RESULTS: Twenty-five subjects (6 female) were recruited and completed the study. The average age of the subjects was 24.51, $\pm$ 4.4 years old in the three groups. All three groups had similar baseline characteristics in age, gender, blood pressure and HRV. Control group has 7subjects (3 female), Vitamin group had 11 subjects (2 female) and NanoGreens group had 7 subjects (2 female). After taking the supplement for four weeks, 8-OHdG level did not show any significant changes in all three groups. Creatinine level was reduced in the NanoGreens group but the decrease did not reach a statistically significant level.

CONCLUSION: After taking the NanoGreens supplement for four weeks, the urine 8-OHdG tests did not detect any significant DNA antioxidant effects in all three groups. (This is an abstract from a conference presentation only and does not represent a full work that has been peer-reviewed and accepted for publication.)

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Erratum

In the Spring 2009 Abstracts of ACC Conference Proceedings: Platform Presentations, the abstract by Koo et al. titled Continuous Measurement of Muscle Morphology Using Sonomyography: A New Technique to Quantify Chiropractic Treatment Efficacy, one of the authors was accidentally omitted.

The correct list of authors is: Terry Koo, New York Chiropractic College; Yongping Zheng, The Hong Kong Polytechnic University; Xin Chen, The Hong Kong Polytechnic University; Antonio Wong, New York Chiropractic College; Lillian Ford, New York Chiropractic College; and Michael Zumpano, New York Chiropractic College.

We apologize for this error and regret any misunderstanding this may have caused.