A Comparison of the Effects of Aerobic and Resistance Training on predicted Vo2 Max and 6 Minute Walking Distance in Healthy Weight, Overweight, and Obese Individuals; a Pilot Study. Backs, D.M., Filla, M.J., Poremba, A.V., Schenk, S.A. Program in Physical Therapy, Maryville University, St. Louis, MO.

Aerobic exercise is the gold standard for VO2 max (maximum oxygen uptake) training; however individuals who are overweight or obese may be unable to participate in a high intensity aerobic training program. **Purpose**: The purpose of this pilot study was to compare the effect of a short term aerobic training program versus a resistance training program on VO2 max and 6 minute walking distance in individuals with healthy weight, overweight, and obesity. The clinical significance of the study was to determine if resistance training would be an effective alternative to aerobic exercise for patients of all body types to improve aerobic capacity and general fitness. **Subjects**: The study consisted of a convenience sample of 12 untrained, healthy, female subjects ranging in age from 19 to 29. The subjects were randomly assigned according to BMI as follows: aerobic normal weight BMI=18.5-24.9 (n=2), resistance normal weight (n=5), aerobic overweight BMI>25 (n=2), and resistance overweight (n=1). Two subjects (both from the aerobic normal weight group) failed to complete the training program due to an unrelated injury and scheduling conflicts. **Methods and Materials**: The study contained a pre-test session, a 6 week supervised exercise program (either resistance or aerobic), and a post-test session. The pre- and post-test measures included the Chester Step Test for VO2 max and the 6 Minute Walk Test. A univariate ANOVA was used for data analysis and the significance level was set at $p<0.05$. **Results**: Tests showed no significant difference from pre- to post-test or between exercise groups for VO2 max and 6 minute walking distance. The variable of weight regardless of exercise type approached statistical significance ($p=0.078$) for VO2 max. The Pearson correlation showed no relationship between VO2 max and 6 Minute Walk Test with a 6 week exercise program ($r=0.218$). **Conclusions**: Despite the lack of statistical significance, the results of VO2 max and walking distance were similar following a training program of resistance or aerobic training. Resistance training and aerobic training did not demonstrate benefits on cardiopulmonary endurance for this cohort of subjects. **Funding Source**: There was no funding source for this study.

Contact: Matt Filla (314)808-5366. mfilla@maryville.edu

Effect of the SaeboFlex Orthosis on upper extremity recovery in patients with chronic spastic hemiplegia: a pilot study. Baker D, Beck K, Fogarty J, Saabye S, Barry J. Program in Physical Therapy, Maryville University of St. Louis, MO. dlehnen@maryville.edu

The SaeboFlex orthosis is a new device designed to aid wrist and hand release function in individuals with limited upper extremity function and spastic hemiplegia. We are not aware of any published research on this device. **Purpose:** The purpose of this pilot study was to examine the effects of a home exercise program utilizing the SaeboFlex orthosis on the affected upper extremity of individuals with chronic spastic hemiplegia. We hypothesized that individuals would have improved function, strength, and range of motion (ROM) following an exercise program with the SaeboFlex orthosis. **Subjects:** Subjects consisted of four men and one woman with a mean age of 58.2 years who had experienced spastic hemiplegia secondary to cerebrovascular accidents (CVA) at least six months prior to this pilot study (mean chronicity 5.98 years). All participants were right-hand dominant prior to CVA, three exhibited hemiparesis on the right side and two on the left. **Methods and Materials:** This pilot study was conducted as a single-group pretest-posttest design. Each subject was issued and custom-fitted with a SaeboFlex orthosis and instructed on the performance of a specific exercise program focusing on grasp and release tasks. They were instructed to exercise 45 minutes twice daily, performing at least 120 repetitions of grasp and release each session. The subjects were pre and posttested for outcome measures including: 1) wrist extension PROM and index PIP flexion AROM by means of goniometry 2) gross MCP extensor and wrist extensor strength by means of MMT 3) grip strength by means of hand-held dynamometry, and 4) upper extremity function as measured by the Action Research Arm Test (ARAT). One subject withdrew from the study prior to completion. The other four subjects performed the program independently for six weeks with weekly follow-ups by the investigators. **Analyses:** Parametric data including wrist extension PROM, index PIP flexion AROM, and grip strength were analyzed using paired *t* tests. The remaining nonparametric data including ARAT, gross MCP extension MMT, and wrist extension MMT was analyzed using Wilcoxen Signed Rank Tests. For this pilot study, *P* values were used to look for statistically significant changes and general trends that support a larger study in the future. **Results:** Among the results of the four subjects who completed the study, increased grip strength ($P = .05$) was statistically significant. The *P* values of the remaining outcome measures were: index PIP flexion AROM ($P = .12$), wrist extension PROM ($P = .06$), ARAT ($P = .14$), and wrist extension strength ($P = .14$), and MCP extension strength ($P = .18$). **Discussion/Conclusions:** Despite the limited size and resources and lack of supervised exercise, the subjects did show a significant improvement for grip strength in this pilot study. The trends seen support the need for further research to determine the efficacy of the SaeboFlex orthosis. Clinically, the use of the SaeboFlex orthosis to help patients with chronic spastic hemiplegia may help reverse the tendency of learned nonuse and restore some function of the affected upper extremity. The investigators recommend that future studies involve a larger and more diverse sample with a control group and blinded testers. Skilled therapy intervention in combination with a more intense home exercise program should also be investigated. **Funding Source:** Saebo, Inc. loaned the braces for the six-week study.

Contact: Deanna Baker (636) 352-9778. dlehnen@maryville.edu

Concentric and Eccentric Strength Differences of the Shoulder Rotators of College-Aged Baseball Players with Elbow Pain: A Pilot Study

Basden CM, SPT, Bolander MN, SPT, Heuschober GR, SPT, Ross SA, PT, DPT, PCS

Purpose. It is critical for physical therapists to identify muscular imbalances that could relate to pain or pathology in distal joints and subsequent limitations or cessation of functional activities and athletic performance. The purpose of our investigation was to determine if there is a relationship between muscular imbalances, both concentric and eccentric strength of the shoulder rotators, and elbow pain in college-aged athletes. . We hypothesized that in a group of symptomatic college-aged baseball players, the dynamic strength ratios of the throwing shoulder would be less than that of asymptomatic college-aged peers. Additionally, the relationship of internal and external rotational shoulder strength would be inversely related to the presence of elbow pain. **Subjects.** Twenty-two subjects between the ages of 18 and 23; eight baseball players with elbow pain, six baseball players without elbow pain, and eight control subjects. Exclusion criteria included subjects with diagnosed shoulder or elbow injuries or surgeries. **Procedures.** Assessment of demographic and subjective pain rating using the Visual Analog Scale. Measurement of active elbow extension. Concentric and eccentric strength testing of shoulder rotators at speeds of 180°.s-_ and 250°.s-_ using an isokinetic dynamometer. **Analyses.** Univariate analyses of variance between subject group and test type for peak torque strength ratios and active elbow extension. Linear regression tests for elbow pain rating and both range of motion and peak torque ratios. **Results.** No significant differences were found between groups or between test speeds for either strength ratio compared. No significant correlation was found between either strength ratios and pain or elbow extension range of motion and pain. Active elbow extension range of motion was significant for the group of baseball players with elbow pain only. **Conclusion.** Although there were no significant differences between our sample groups, it was consistent throughout all subjects that eccentric external rotational strength was approximately 50% that of concentric internal rotational strength, significantly less than the normal range of 65% to 70%. With our knowledge of the demands on the shoulder during the deceleration/follow-through phase of throwing, it is imperative that muscle balance is achieved across both the anterior and posterior aspect of the glenohumeral joint. Further research is recommended to correlate distal joint pathologies to proximal muscular imbalances.

Contact: Micah Bolander 314-440-6381 mbolander@maryville.edu

Establishing normative strength values for hyperpronators using the standing heel rise test: a pilot study. Michael Coalson, Matthew Damrell, David Johnson, Kyle Stein, Jack BennettSPT. Program in Physical Therapy, Maryville University, St. Louis, MO.

This study intended to establish normative strength values of the plantar flexors, primarily the gastrocnemius muscle, in individuals with hyperpronation using the standing heel rise test. The specific aim of this study was to establish a value which can be considered a normal muscle grade of the gastrocnemius for hyperpronators when using the standing heel rise test.

Following the principles of the length tension relationship, individuals with hyperpronation should have less torque producing capability of the gastrocnemius, as compared to individuals with ideal foot posture. The decreased torque production in individuals with hyperpronation will influence several activities of daily living that require gastrocnemius strength including standing and walking. The standing heel rise test is a clinically applicable measure for clinicians to determine gastrocnemius strength.

In a recent study by Snook, subjects with excessive pronation demonstrated decreased plantar flexion strength compared to individuals with ideal foot posture when tested with an isokinetic machine. However, there is currently no research available on normative strength values for hyperpronators using the standing heel rise test.

The hypothesis of this study was that individuals with hyperpronation would perform fewer heel rises than individuals with normal foot posture using the standing heel rise test. This study used a convenience sample of 23 subjects form Maryville University including students, faculty, and staff. The ages of subjects ranged from 18-35 with an average age of 22.78. Navicular drop was used to measure the amount of foot pronation and was taken using a modified version of Brody's method of navicular drop measurement. After measuring navicular drop, the strength of the gastrocnemius muscle was measured by using the standing heel rise test. Prior to data collection, reliability testing was conducted for navicular drop and standing heel rise tests. The navicular drop test showed acceptable inter-rater reliability (.70-.76), while the standing heel rise test showed acceptable inter-rater reliability (.57-.74) and very good intra-rater reliability (.90), using Cronbach's Alpha score.

The results of the study showed that hyperpronation with 10+ mm of navicular drop demonstrated decreased gastrocnemius strength when measured by the standing heel rise test. This study showed that the group comprised of individuals with normal amounts of navicular drop showed an average of 16.47 heel rises completed, while the hyperpronator group showed an average of 9.75 heel rises completed. The results of the Pearson product moment correlation showed adequate significance for an inverse relationship between navicular drop and the number of heel rises completed with
r= -.421.

Based on the results of our study, we concluded that a normal muscle grade for individuals with 10 mm or greater of navicular drop should be less than the current standard of 20 heel rises as suggested by Hislop. However, further research with larger subject samples is needed to determine exact number which can be considered a normal muscle grade for the gastrocnemius muscle in individuals with hyperpronation using the standing heel rise test.

THE EFFECTIVENESS OF THERATOGS™ ON GAIT IN A 5 YEAR-OLD CHILD WITH SPASTIC HEMIPLEGIA. Engelmeyer,K., Meyer, A., Quinlisk, A., Wassell, M., Ross, S., Program in Physical Therapy, Maryville University, St. Louis, MO.

Gait abnormalities often exist in children with spastic hemiplegia. TheraTogs™ are a new intervention that consists of an orthopedic undergarment and strapping system and has been recommended to improve gait patterns; however no research has been conducted on the effect of the device. **Purpose:** The purpose of our study was to determine the effect of TheraTogs™ on the gait pattern of a 5-year-old child with spastic hemiplegia. **Subject:** A 5 year-old child diagnosed with spastic hemiplegia who walked with a walker. **Methods**: The study was a single-subject prospective experimental analysis of differences that investigated the effectiveness of TheraTogs™ using a single strapping application to see how they affected gait dynamics measured using a GAITRite® system. The data collection included 5 test sessions; each session consisted of three trials of ambulating on the GAITRite®. An initial baseline was established on the first session, after which the TheraTogs™ were introduced. The subject wore them for 4 weeks; sessions were performed after initial application and both 2 and 4 weeks post application. The TheraTogs™ were then removed for 2 weeks and a final session was performed. The data collected included velocity, stride length, cadence, step time, heel to midline base of support, and toe in/out. **Data Analysis**: The data in this study was analyzed using a two-standard-deviation band analysis for each gait parameter. The results were considered significant if they were two standard deviations above or below the baseline mean. **Results:** Significant improvements were found in heel to midline base of support, velocity, and cadence when comparing the baseline measure to measures post intervention. No significant difference was found for step time, stride length, or right toe in/out. A significant decline was found for left toe in/out. A positive carryover effect was significant for velocity, cadence, and heel to midline base of support. **Conclusion**: The results of the study were mixed, showing gains in some gait variables, no change in others, and a decline in one variable. This is a single subject case design and generalizability of the results should be considered with caution.

Contact: Kelly Engelmeyer 636-357-1593. kengelmeyer@maryville.edu

The Effect of High Frequency Transcutaneous Electrical Nerve Stimulation on Heart Rate in Healthy 18-30 Year Old Subjects: a Pilot Study. Dias, K., Gillardi, A., Kuck, A., Meyer, D., Robertson, A. Program in Physical Therapy, Maryville University, St. Louis, MO.

Background and Purpose. Heart rate (HR) increases as a result of stimulation of the sympathetic nervous system (SNS). Interventions to regulate sympathetic activity, such as TENS, have demonstrated promise in their ability to improve outcomes in patients with chronic diseases such as chronic heart failure and coronary artery disease. Transcutaneous electrical nerve stimulation (TENS) decreases SNS activity by blocking afferent nerve signals. Preliminary trials using TENS have demonstrated an ability to alter autonomic activity measured by blood pressure and peripheral blood flow. However, there has been little research on the effects of TENS on HR. The purpose of this pilot study was to determine the effects of TENS on HR in healthy eighteen to thirty year old individuals. The primary goal of this study was to determine the effects of TENS on reducing sympathetic measured responses to a handgrip strength test, valsalva maneuver, and treadmill walking. The secondary goal of this study was to determine if TENS will reduce measures of SNS dominance at rest. We hypothesized that TENS would decrease HR during SNS stimulating activities and during rest. **Subjects.** Eight healthy eighteen to thirty year old college students, four males and four females with a mean age of 20.88, participated in the study. **Methods.** Participants performed three SNS stimulating activities including a valsalva maneuver, handgrip strength test, and treadmill walking while his/her HR was recorded. Participants completed these activities on three consecutive days, the first two of which no TENS was utilized. The third day TENS was applied over the sympathetic ganglion of the lower cervical and the upper thoracic areas. Data was analyzed using paired t-tests in SPSS. Day one and day two data were compared to determine if baseline measurements remained stable. Day one and day three data were compared to determine if TENS had an effect on HR. **Results.** When comparing day one and day two data, no significant differences was found. The results showed a significant decline in HR with TENS stimulation during the rest period prior to treadmill walking ($p=.043$) and during treadmill walking at the five minute mark ($p=.011$). No significant differences were found for all other variables. **Discussion and Conclusion.** No significant changes were observed in HR immediately after the application of TENS, evidenced by no changes in HR for grip strength or valsalva maneuver. A significant decline in HR was observed with longer periods of TENS stimulation, as seen during the rest period prior to treadmill walking and during treadmill walking at the five minute mark. Therefore, it may be beneficial to apply TENS for an initial period of greater than fifteen minutes prior to testing to obtain the true effects of TENS on the SNS. Further research is needed involving larger populations of healthy participants and finally in persons with cardiac pathologies.

Contact: Angela Gillardi 314-808-7491. agillardi@maryville.edu

A Comparison of Student and Faculty Perspectives on Learning Activities that Promote Reflection. Kliebert, K. & Tomlinson, E., Decker, A. Department of Physical Therapy Education, Rockhurst University. deckera@rockhurst.edu

The complexity of today's physical therapy client makes reflection a necessary skill for the physical therapist of the 21st century. Educating students on how to be reflective practitioners has become an important component of physical therapy education programs. **Purpose:** The purpose of this study was to examine the use of reflective activities by faculty and to compare student and faculty perceptions regarding the effectiveness of these activities. **Subjects:** One hundred sixty-three full-time students enrolled in an entry-level physical therapy program and forty faculty members completed a survey on the topic of learning activities that promote reflection. **Methods and Materials:** An electronic message including a link to an online survey hosted by Zoomerang software was developed by the researchers to question both students and faculty from Midwest physical therapy programs regarding the use and importance of reflective techniques in the physical therapy curriculum. Subjects were surveyed on five different activities found to promote reflective practice ranging from attending a lecture on the topic of reflection to reflective discussion between students and instructors via web board. Internal University Review Board approved this research project prior to launch of the survey. **Analyses:** Analytical data was completed using SPSS v. 13. Descriptive statistics gathered showed 96% of students participated in and 100% of faculty engaged students in group discussion to promote reflective practice. Students working towards a Master's degree report lectures on reflection of less benefit than peers enrolled in DPT programs. **Results:** Results demonstrate students participate in reflective activities and faculty often engage students in reflective activities. Both students and faculty report group discussion as most beneficial and efficient means for reflection. **Conclusions:** Various activities that promote reflection are being incorporated in physical therapy programs throughout the Midwest to assist developing student physical therapists into reflective practitioners. **Funding Source:** The authors of this study have received no monetary support for this study, nor is any financial gain expected from the results of this study.

Patient Perceptions about Physical Therapist Appearance and Behaviors

Authors: Boulton, JL, Hargis, DM, Hunt, MJB, Winder, MA, Dronberger, JA. Physical Therapy Education Program, Rockhurst University, Kansas City, MO.

Purpose: To investigate patient perceptions about the appearance and behaviors of physical therapists in the outpatient setting.

Subjects: 177 self-administered questionnaires were provided to patients, yielding a 95% return rate. Respondents ranged in age from 18 to 88 years. Inclusion criteria required that the respondents attend at least three outpatient physical therapy sessions and be ≥18 years of age. Eight clinics were included in this study.

Methods & Materials: Questionnaires were given to the patients by the researchers of this study and by the staff of included clinics. Each respondent was asked to complete a survey following the third or fourth visit to the clinic: confidentiality was maintained during its completion. The survey was either returned to the person who provided it or placed in a designated, secure drop-off box.

Analyses: SPSS 13 was used to calculate Pearson Correlation, Spearman Correlation, and Cross Tabs across all comparisons.

Results: Survey results revealed the following correlations (1) older respondents had more pronounced preferences about the appearance of male therapists (notably in regard to facial hair and hair length) than did younger respondents. Respondents were less influenced by the dress/appearance of female therapists (2) respondents who reported that they are negatively influenced by a therapist's excess weight were also those who preferred to have their diagnoses explained in greater detail, and (3) the location where patients were treated (e.g. in an open area) influenced their level of concentration during treatment.

Conclusions: Results suggest that patients do have strong opinions in regard to male physical therapist appearance, excess weight of therapists of either gender, the degree to which their diagnoses are explained, and the level of privacy within the treatment area. Therapists may wish to be aware of these concerns when providing care to their patients.

Funding Source: None.

THE EFFECT OF THE MENSTRUAL CYCLE ON ACL TEARS IN HIGH SCHOOL AGED FEMALES. Dean, S.K., Faris, R.C., Foley, A., Sparks, J.L. Program in Physical Therapy, Rockhurst University, Kansas City, MO. Amy.Foley@rockhurst.edu

Background & Purpose: Anterior Cruciate Ligament (ACL) tears have become more prevalent in females, with females suffering four to eight times the number of ACL injuries compared to men. Research has shown multiple mechanisms of injury, however, the main purpose of this study is to find out if there is a relationship between ACL tears and the phases of the menstrual cycle.
Subjects: Twelve female subjects were recruited from the greater Kansas City area to participate in a self-reported written survey pertaining to their past ACL injury. Subjects average age was 16.75 ± 1.65 years with no reported previous pregnancies. **Methods:** A survey previously used by Wojtys, et al. was used to collect data on this study. The reliability and validity of this survey has been previously established. The surveys were distributed to participating physician and physical therapy clinics. The mechanism of injury, details about the menstrual cycle, oral contraceptives, minutes played until injured, and ankle protection were all recorded in the survey. The data were coded and compiled for statistical analysis.
Analysis: Comparisons were made between phases in the menstrual cycle in relation to injury using Friedman Analysis of Variance for Correlated Samples. Alpha level was set at 0.05.
Results: Friedman test showed no significant difference between the phase of menstrual cycle and ACL injury ($p>.17$). This indicates that the phase of the cycle has no effect on the ACL injury. **Conclusion:** Although 6 women reported injuries in the luteal period as compared to 5 in the follicular and 1 in the ovulatory this difference did not reach the level of significance. Clinically, regardless of what menstrual phase women are in ACL injuries still occur. This study should be expanded to include a larger number of participants to enhance the strength of the investigation.

NEUROMUSCULAR STIMULATION IMPROVES GRASPING FUNCTION IN INDIVIDUALS WITH CHRONIC STROKE. B. Quaney, LH. Zahner, MJ. Santos, Z. Kadivar, C. Cao, S. Frank, S. Hurt, B. McKiernan, Landon Center on Aging, University of Kansas, Kansas City, KS, Physical Therapy and Rehabilitation Sciences, Kansas University Medical Center, Kansas City, KS, Physical Therapy Education, Rockhurst University, Kansas City, MO. brian.mckiernan@rockhurst.edu

Purpose/Hypothesis: Despite rehabilitation efforts, 60% of individuals continue to have significant upper extremity (UE) disability one year poststroke. It is unclear if manual dexterity can be further improved after this time. The purpose of this pilot study was: 1) To determine if neuromuscular stimulation (NMES) improves grasping function in individuals with chronic stroke, and 2) To determine if grasping function is enhanced when NMES is used during functional task training. **Subjects:** Six subjects (58 ± 2.9 y/o) with chronic ischemic stroke (3 - 10 yrs. post-stroke) and severe hand dysfunction participated in this study. **Materials/Methods:** Each subject received two applications of NMES (passive vs. functional) in a counterbalanced order (30 min x 5x/wk x 2 wks). Passive NMES was performed by placing the impaired forearm in a mid-position and stimulating the wrist flexors and extensors to produce two contractions/minute (30 contractions). Functional NMES was performed using single channels from two separate stimulators to assist grasping and releasing a tennis ball (30 repetitions). UE motor performance speed, function and strength was measured at baseline, following treatment and two weeks after treatment using conventional clinical tests: a) UE Fugl-Meyer (FM); b) Box and Block (BB); c) Jebsens Dexterity Test (JDT); d) Grip Strength (GS) and e) Pinch Strength (PS). **Results:** While subjects generally improved motor performance speed, function and strength with both applications of NMES, significant gains in fine motor skills were specific to the functional NMES. Compared to baseline, functional NMES increased movement speeds in the JDT by 17% ($p < 0.02$) and increased FM scores by 19% ($p < 0.05$). In contrast, passive NMES only demonstrated significant gains in FM (18%; $p < 0.04$). JDT improvements using functional NMES continued to be significant two weeks after treatment. **Conclusions:** NMES appears to be a viable method for facilitating motor performance gains in chronic stroke, especially when paired with functional task training. The increased grasping function observed with this brief therapeutic intervention is most likely due to mechanisms other than muscle hypertrophy. **Clinical Relevance:** The increased movement speeds (JDT) suggest that fine motor control can be improved by applying NMES during a grasping task.

A COMPARISON OF HAND STRENGTH AND BALANCE IN ROCK CLIMBERS AND NON-CLIMBERS Kreher, JL, Muehl, AM, Swanson, MB, Wilson, BT, and Hiebert, JM. Physical Therapy Education, Rockhurst University, Kansas City, MO. jean.hiebert@rockhurst.edu

Purpose: The mechanics involved in rock climbing suggest that climbers would demonstrate increased hand strength and balance when compared to individuals that do not participate in this sport. Therefore, the purpose of this study was to compare these variables in two groups of individuals: one group that regularly exercises by rock climbing and a second group that regularly exercises using some other type of aerobic activity (running, bicycling, etc.).
Subjects: Two groups of 12 males and 4 females volunteered for this study. One group consisted of intermediate to advance-skilled rock climbers (age = 27.00 ±4.6 years; weight = 155 ±27.5 lbs) who climb at least 8-12 times a month. The other group consisted of non-climbers (age = 24.25 ±3.0 years; weight = 177±27.4 lbs) that participate in 20-30 minutes of aerobic exercise at least 8-12 times per month. All subjects reported exercising at a rating of perceived exertion of 7/10 or greater and reported being right hand and leg dominant.
Methods and Materials: Three jaw pinch, key pinch, tip to tip pinch, and handgrip strength (five positions) for the right and left hands were assessed using the Greenleaf Eval System (Palo Alto, California). The Balance Master 6.0 (Clackamus, Oregon) assessed unilateral stance with eyes open and closed, bilateral stance standing on firm and foam surfaces with eyes open and closed, limits of stability, and rhythmic weight shift.
Analysis and Results: Independent t-tests were performed using *SPSS 13.0*. Results indicated that climbers exhibited greater handgrip strength relative to body weight in all positions bilaterally except grip position 5 on the left ($p \leq .05$). Climbers also had fewer touch downs with their left foot during unilateral stance on the right with their eyes closed; decreased sway during bilateral stance when standing on a firm surface with eyes closed; and increased displacement of center of gravity when moving forward and obliquely forward to the left ($p \leq .05$).
Conclusions: These findings suggest rock climbing may provide additional benefits than those obtained by aerobic conditioning alone. It may serve as an alternative to traditional rehabilitation exercise for individuals in need of developing hand strength and balance capabilities.

THE DEVELOPMENT OF LEADERSHIP IN PHYSICAL THERAPY Martin, JL, Russell, SA, Sonderegger, SA, Spake, EF. Department of Physical Therapy Education, Rockhurst University, Kansas City, MO ellen.spake@rockhust.edu .

Purpose: The development of leadership has been studied in many fields, but has not been well documented in physical therapy. Active responsibility for the growth of the profession has been identified as an integral aspect of professionalism, as reflected in one of the six pillars of Vision 2020. The purpose of this qualitative study was to describe and explain influences in the development of leadership in the physical therapy profession.
Subjects: Fourteen current members of the APTA Board of Directors as well as one past president of the Association comprised a sample of convenience for this study. All subjects had held multiple leadership positions within the Association.
Methods and Materials: All current members of the APTA Board of Directors and one past president were invited to participate in a telephone interview about their development as a leader in the profession. Fourteen of the fifteen board members and one identified past president agreed to participate. A semi-structured interview format consisting of five to eight open ended questions based on individual response was utilized. Published materials and transcripts of taped interviews were qualitatively analyzed to describe and explain pathways to leadership.
Analyses: Content analysis was conducted by four examiners. Each researcher independently developed a qualitative coding procedure to evaluate the written artifacts and transcribed interviews. Recurring regularities in data reproduced patterns that were sorted into categories and emergent themes were compared across examiners. Reliability was ensured through the use of multiple, independent examiners and low inference descriptors. Validity was ensured through the use of systematic coding, analytical triangulation, and a search for negative evidence.
Results: Six themes were derived utilizing content analysis from written materials and transcripted interviews: Participation in community activities prior to PT school, influence of PT faculty as role models, student involvement in professional activities, importance of mentors, opportunity, and strategic planning toward leadership.
Conclusions: Understanding the influences that have impacted the development of current leaders in the profession can sensitize and empower others to recognize both the potential for growth as well as provide a model for systematic planning towards leadership.
Funding: None

AN EXAMINATION OF THE EFFECT OF ANTERIOR AND POSTERIOR HEEL FLARE ON KINEMATIC CHARACTERISTICS OF HUMAN GAIT. Rose, G., Hunt G., Knutson, L., Department of Physical Therapy, Missouri State University, Springfield, MO. Rose032@missouristate.edu

Purpose: The intent of this study was to determine effects of anterior and posterior heel flare on kinematic variables at the hip, knee, and forward tibial advancement from heel contact through loading response during a walking gait cycle.
Background: The literature reports that lateral heel flare may be associated with various foot and leg injuries. Studies on the effects of anterior and posterior heel flare have not gained the same attention. However, one recent running study evaluated the kinetic effects of posterior heel flare and its possible relation to chronic exertional compartment syndrome in the anterior leg. Since walking as a mode of exercise to improve fitness has been encouraged for deconditioned individuals, it seems appropriate that similar heel design studies with walking are needed.
Subjects/Methods: Digital video recordings were taken of four female subjects walking at self selected speeds for five trials of each heel condition (anterior and posterior). Angular velocities of lower extremity joints and segments were analyzed using Pro Sport 5.1 software. Single-subject data were examined for serial dependency and evaluated through visual appraisal, slope analysis, and effect size.
Results: No serial dependency was found. Hip and knee angular velocities revealed marked variability patterns across subjects. The largest angular displacement occurred with forward tibial advancement for all subjects. Angular tibial velocity through the ankle joint increased with the posterior flare in 3 of 4 subjects. Effect size of angular tibial velocity, as determined by paired t-tests and omega^2, for the same three subjects ranged from 0.73 to 0.90.
Conclusion: Initial results suggest that posterior heel flare may lead to increased eccentric loading of anterior compartment muscles with an elevated risk of overuse syndromes. Clinicians should consider the influence of heel design on anterior leg muscle activity when educating clients on footwear selection. Based on these results, further evaluation of posterior heel flare during walking is warranted.

Contact: Gabrielle Rose (417) 425-6463 Rose032@missouristate.edu

ARCH TAPING AS A SYMPTOMATIC TREATMENT IN PATIENTS WITH SEVER'S DISEASE: A MULTIPLE CASE SERIES. Hunt G.C., Stowell T., Alnwick G., Evans S, Missouri State University, Springfield, MO, Franklin Pierce College, Concord , NH, Cox Health Care Systems, Springfield, MO garyhunt@missouristate.edu

Purpose: To describe the clinical outcomes of arch taping in controlling heel pain during ambulation in subjects with Sever's disease and to discuss possible biomechanical explanations. **Background:** Sever's disease, is a musculoskeletal condition occurring in adolescence that symptomatically manifests as posterior heel pain during ambulation. Often participation in physical activity is severely limited resulting in frustration for children and parents alike. Conservative treatment options have included rest, abstinence from athletic activity, heel lifts, foot orthotic devices, ice, and calf-stretching exercise. The authors are proposing arch taping as a viable treatment option for controlling heel pain during athletic and other weight-bearing activities in patients with Sever's disease.
Methods and Measures: Eleven subjects diagnosed with Sever's disease with a history of posterior heel pain were included in this study. The subjects were evaluated and treated by three different therapists in three different regions in the USA. The main treatment consisted of arch taping. Two of the eleven subjects of this multiple case series were studied using single subject design analysis comparing time to onset of pain during treadmill ambulation with and without arch taping. The treatment response to arch taping was described in the remaining nine cases of this series. **Results:** Each subject reported an immediate reduction in heel pain during ambulation and functional activities with arch taping, and those who participated in organized youth sports were able to return to competition earlier than reported in the literature. Visual and statistical analysis using the Two Standard Deviation Band method for two subjects showed improvement at the $P<0.05$ significance level for ambulation time with arch taping. **Conclusions:** The arch taping technique applied in these cases was effective in the immediate control of pain during ambulation and sports activities. This technique could be considered a viable treatment option for other individuals with similar clinical presentations. Possible biomechanical explanations may relate to a windlass effect provided by the taping technique.

Contact: Gary Hunt 417 598-0764 garyhunt@missouristate.edu

CONSERVATIVE MANAGEMENT OF OSTEOCHONDRAL DEFECT IN THE TALOCRUAL JOINT: A CASE REPORT. Lerche, F., Hunt G.C., Cox Health Care Systems and Physical Therapy Program, Missouri State University, Springfield, Missouri. Lerche2@sbcglobal.net

Purpose: Foot pain secondary to osteochondral defect in the talocrual joint can severely affect an individual's gait and functional abilities. The purpose of presenting this case is to outline a conservative approach that was utilized to manage this problem that included orthotic and exercise intervention. **Subject:** The subject was a middle-aged female with an 18 month history of chronic right ankle pain following a motor vehicle accident. Conservative treatment provided marginal relief after which time the patient decided to seek further orthopaedic consultation. MRI revealed an anterior tibial osteophyte with possible osteochondral defect in the medial ankle which was later confirmed during arthroscopic surgery. Postoperative physical therapy was uncomplicated but she was still having residual activity pain rated 7-8/10 and antalgic gait abnormalities. Weight-bearing radiographic examination documented a talar tilt of 9^{o}. Physical therapy reassessment revealed weakness of the peroneus longus (4/5) associated with difficulty in single leg balance testing. **Methods:** Treatment included: 1) custom hindfoot orthosis for the right ankle fabricated with low temperature plastic, 2) motor control exercise to improve peroneus longus function, and 3) single leg balancing activities. Pain and functional levels were assessed through perceived rating scales to document treatment response. **Analyses:** Perceived pain and functional activity levels and trends were graphed with excel spreadsheet for visual and comparative analysis. **Results:** The subject reported marked reduction in pain and increased functional activity while using the hindfoot orthosis. Steady pain reduction and increased functional activity improved over the course of treatment. Follow-up weight-bearing radiographs while wearing the hindfoot orthosis revealed a talar tilt angle reduction of 3.2^{o}. Peroneus longus force production improved to 5/5 and single leg balance time increased from 3 seconds to 20 seconds with follow-up assessment. **Conclusions:** The positive results in this case are encouraging and suggest that orthotic hindfoot control combined with exercise and balance training maybe a viable intervention option for osteochondral defect of the ankle. Documentation of other similar cases with this intervention approach would be helpful to determine its effectiveness in managing this condition.

Contact: Fred Lerche (417) 269-5500, Lerche2@sbcglobal.net

The use of the BrainPort™ balance device to Facilitate Balance and Gait in an Individual with Bilateral Prosthetic Legs and Bilateral Vestibular Dysfunction (BVD) due to Gentamicin Ototoxicity.

Stephen E. Price, Barbara S. Robinson, Jeanne L. Cook, Cynthia McCormick Richburg.
Missouri State University, Springfield, MO, Cox Health Care Systems, Springfield, MO
Stephen923@missouristate.edu

Study Design: Case Study **Purpose:** To determine the efficacy of the BrainPort™, an electrotactile vestibular sensory substitution device, on static and dynamic standing balance and gait of a subject with bilateral vestibular dysfunction (BVD) and bilateral transtibial amputation (TTA). **Subject:** The subject was a 69-year-old male with BVD due to gentamicin ototoxicity. The subject had bilateral prosthetic legs after TTA due to lower extremity infection; significant co-morbidities were present. **Methods and Materials:** Physical therapy intervention focused on training with the BrainPort™ balance device over 12-weeks, and was organized in three phases: orientation, clinical training, and in-home training. The subject was assessed with objective balance (SOT) and gait tests (DGI, 6-minute walk test), as well as functional outcome measures (ABC, DHI) at the end of weeks 1, 2, 4, 8, and 12. Descriptive statistics were employed for analysis. **Results:** Intervention with the BrainPort™ balance device was effective in improving the subject's gait and balance; decreased functional limitations were noted. The subject reported improvements in gaze stability; however, symptoms of oscillopsia did not diminish. **Conclusion:** Improvement was demonstrated in all outcome measures used. Marked changes were observed in the subject's balance and gait. Residual effects occurred that might be attributed to active stimulation of brainstem nuclei. The use of the BrainPort™ balance device warrants further research.
Acknowledgements: Wicab, Inc.

Comparison of Infraspinatus Strength in the Dominant (Pitching) Arm Vs the Non-Dominant Arm in Minor League Baseball Pitchers. Barton, H., Wallentine S. Department of Physical Therapy, Missouri State University, Springfield, MO.
swallentine@missouristate.edu

Purpose: The purpose of this study was to compare infraspinatus muscle strength in dominant Vs non-dominant arms of minor league baseball pitchers. **Subjects**: Eight pitchers from the Springfield Cardinals (AA affiliate of the St. Louis Cardinals) baseball team participated in the study. **Methods**: A hand held dynamometer was used to assess infraspinatus muscle strength. Subjects sat with the arm at their side in a position of 90º of elbow flexion and 45º of shoulder internal rotation while the examiner applied resistance at the wrist. A standard goniometer was used to ensure that the testing position was consistent for each subject. Three trials were performed for each arm. **Results:** Seven of the 8 pitchers demonstrated dominant infraspinatus muscle weakness when compared to the non-dominant muscle. The mean difference in strength was 4.87 lbs of force. A paired T-test was used to assess the difference between the means of dominant Vs non-dominant infraspinatus strength. **Conclusion:** Upon comparison, there was a statistically significant difference (at the .05 level) which showed that the infraspinatus muscle of the non-dominant arm was stronger than the infraspinatus muscle of the dominant arm. This may be evidence to support the hypothesis that pitchers develop infraspinatus weakness early in their careers due to repetitive traction of the suprascapular nerve at the spinoglenoid notch.

Contact: Scott Wallentine (417) 836-4514. swallentine@missouristate.edu

WOUND CARE AFTER CANCER TREATMENT AND NECROTIZING FASCIITIS; A RETROSPECTIVE CHART REVIEW. Matheny, C., Caudill, S. Program in Physical Therapy, Southwest Baptist University, Bolivar MO. cmatheny@sbuniv.edu.

PURPOSE: The purpose of this study was to describe the interventions used to heal the wound of a diabetic female with necrotic fasciitis status post chemotherapy, radiation therapy and colonic resection. **SUBJECT:** The single subject for this study was a 64-year-old female status post chemotherapy, radiation therapy and colonic resection following a diagnosis of cancer. After surgery the subject developed necrotic fasciitis in her lower abdomen, left hip and posterior left thigh, which destroyed a large amount of subcutaneous tissue, muscle tissue, neuronal tissue and fascia. **INTERVENTIONS:** The wound on the posterior thigh and buttock were surgically debrided until viable tissue was found. A wound vac with automatic saline flush was placed and the wound was packed with dakin's-soaked kerlix and covered. The wound vac remained in place and dressing changes continued packing the wound with dakin's-soaked kerlix as needed. **METHOD:** The size of the open wound and the type of tissue present was used to determine the progression of healing. Initially, the wound on the posterior thigh measured 9.0 cm wide, 30 cm long and 7 cm deep. The wound was 95% red granulation tissue and 5% yellow slough. At the time of discharge, the wound measured 3.0 cm wide, 30 cm long, and 0.6 cm deep and was completely covered with healthy granulation tissue. Approximately three weeks later a skin graft was performed to cover the wound. Data was collected using a retrospective chart review. **RESULTS:** The wound was completely healed in approximately 8 weeks following surgical debridement; wound care that included a wound vac and packing with dakin's-soaked kerlix and a skin graft. **CONCLUSION:** Results of this case study support use of a wound care protocol that included dakin's-soaked kerlix, a wound vac and skin grafting as effective forms of intervention for a diabetic patient with necrotizing fasciitis, status post chemotherapy, radiation therapy and colonic resection.

Contact: Connie Matheny 417-328-1910. cmatheny@sbuniv.edu

CRITICAL THINKING: DOES EDUCATIONAL LEVEL MAKE A DIFFERENCE IN THE CRITICAL THINKING SKILLS OF PHYSICAL THERAPIST STUDENTS?

Matheny, C. Program in Physical Therapy, Southwest Baptist University, Bolivar, MO. cmatheny@sbuniv.edu, Zabel, R. University of Central Arkansas.

PURPOSE: The purpose of this study was to examine and compare the critical thinking skills of physical therapist students educated at the master's level and the doctoral level. **SUBJECTS:** The subjects of this study were students enrolled in either a master's level or doctoral level physical therapist education program. Inclusion criteria for participation in this study were the completion of both the didactic and clinical components of a physical therapist educational program. **METHODS:** Physical therapist students from master's level and doctoral level programs were recruited to participate in this study. Students were given the California Critical Thinking Skills Test (CCTST) to determine their level of critical thinking skills. The test was a 34-question, non-discipline-specific, multiple-choice test. **ANALYSIS:** The data were analyzed using the unpaired independent t-test, means, standard deviations, range, and norm percentiles. Comparison of means and standard deviations of test scores at each educational level were conducted to determine if a significant difference was present between the two groups of students. **RESULTS:** For the sample tested in this study, scores ranged from a low of 11 to a high of 30 out of 34. The mean score for the master's level students was (n=64) 19.47 (SD = 4.06). For students at the doctoral level the mean score (n = 43) was 20.79 (SD = 4.63). The results of the t-test indicated no significant difference between total CCTST scores of master's level students and doctoral level students. ($p = .14$, $t = (-)1.5$, $df = 105$). **CONCLUSION**: Based on the use of a commercially available instrument in critical thinking**,** critical thinking skills of master's level physical therapist students are not significantly different from physical therapist students at the doctoral level. Development of a discipline-specific tool to measure critical thinking in physical therapists students may be needed to detect differences between those educated at the master's level verses those educated at the doctoral level.

Contact: Connie Matheny 417-328-1910. cmatheny@sbuniv.edu

CHANGES IN GROSS MOTOR FUNCTION MEASURE (GMFM) 8 MONTHS POST SELECTIVE DORSAL RHIZOTOMY (SDR) AND REHABILITATION ACCOUNTING FOR GROWTH AND MATURATION

Puglisi JA, Ross SA, Collins DR, Park TS, Engsberg JR, Therapy Services Department, St. Louis Children's Hospital, Department of Pediatric Neurosurgery, Human Performance Laboratory, Washington University School of Medicine.

OBJECTIVE: The purpose of this investigation was to determine the changes in GMFM 8 months post SDR and rehabilitation accounting for growth and maturation.

DESIGN: Retrospective nonrandomized study using before-after trial.

SETTING: Teaching Institution, Children's Hospital.

SUBJECTS: One hundred eighteen subjects (age 5.9 years, range 2-36) with spastic CP, (69 male, 49 female) underwent SDR. Forty four were independent ambulators, 60 used an assistive device, and 14 were non ambulators (GMFCS levels I=12, II=45, III=32, IV=26 and V=3). The subjects included all patients undergoing SDR in years 1999 and 2000 at St. Louis Children's Hospital. Subjects were diagnosed with spastic diplegia (n=98), spastic triplegia (n=4) and spastic quadriplegia (n=16).

METHODS: SDR is a surgical procedure used to reduce spasticity and improve function in individuals with cerebral palsy (CP). The Gross Motor Function Classification System (GMFCS) is a five-level system intended to classify the severity of motor involvement in children with cerebral palsy. The GMFM is a standard criterion-referenced test designed to assess change in function in children with CP. Subjects were tested on the day before SDR and 8 months later using the GMFM. They were assigned a pre-operative GMFCS level.

INTERVENTION: Subjects underwent SDR and 8 months postoperative rehabilitation consisting of intensive PT 4 times/per week.

MEASUREMENTS AND MAIN RESULTS: A formula was used for predicting changes in GMFM scores based on pre-operative GMFCS levels with consideration of expected maturation in this group. The predicted developmental change score was subtracted from the 8 month post-operative score. A paired t-test was used to determine if a significant difference ($p<0.05$) existed between pre-operative and 8 month post-operative GMFM scores with the predicted improvements that would be associated with normal growth and maturation removed. There was a highly significant difference ($p<.001$) between the pre-operative and the actual 8 month post-operative GMFM scores.

CONCLUSION: Following SDR and rehabilitation, improvements in GMFM at 8 months post-operative was significantly greater than what was developmentally predicted based on age and GMFCS for this group of patients. Long-term studies using the GMFM should consider adjusting for growth and maturation to determine the true effect of a treatment.

Effectiveness of Intensive Sports Programs for Children with Cerebral Palsy (CP)

Miros, J.E., Koyn, D., Olson, N.M., Brunstrom, J.E. St. Louis Children's Hospital
One Children's Place, St. Louis, MO. jem0061@bjc.org

Purpose: Determine efficacy of an intensive sports program for children with CP.
Subjects: Sixteen participants (six females, ten males) between the ages of six and fourteen years old (mean= 10.4) were divided in the following Gross Motor Functional Classification System (GMFCS), I=6, II=3, III= 7. Sports program participants in the GMFCS IV and V were excluded from this study due to their inability to complete the motor assessments.
Methods: All participants completed motor assessments before and after the sports program consisting of 1) Timed Up and Go (TUG), 2) balance walking on a line, and 3) balance tests. Parents and participants completed a) Pediatric Outcomes Data Collection Instrument (PODCI), b) Impact of Childhood Neurologic Disability Scale (ICNDS), and c) Children's Assessment of Participation and Enjoyment (CAPE). A 2-Tailed Paired *t* Test was used to test significance of the motor assessments.
Intervention: Participants were at the sports program five days per week for up to six weeks for six hours each day. They learned sports skills from physical therapists and trained volunteers. They participated in baseball, basketball, dance, adaptive cycling, martial arts, ice-skating, hockey, swimming, soccer, tennis, and volleyball. The program adapted sports for varying levels of abilities and made modifications when necessary.
Results: Significant changes ($p=0.043$) from pre-assessment to post-assessment occurred in the TUG. There were no other significant changes in the other functional tests administered. Self-esteem measures will continue to be studied over the next six months.
Conclusion: The data supported motor function improvement in the TUG after the sports program intervention. Future considerations include refining outcomes tool and expanding the sports program to other pediatric populations. Also, sports programs for children with CP should be incorporated into a community setting by a local recreation center with the assistance of a physical therapist.
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Contact: Jennifer Miros 314.454.2604
jem0061@bjc.org

Title: ASSESSING AND TARGETING HEALTH RISKS AMONG HEALTHCARE EMPLOYEES: A MODEL PROGRAM

SUSAN B RACETTE, PhD[1], SUSAN S DEUSINGER, PT PhD[1] and KATHLEEN A KILLION, PT[2]. [1]St. Louis, MO, United States and [2]St. Louis, MO, United States.

Background: BJC HealthCare[SM], one of the largest nonprofit health care systems in the US, launched a health literacy program to promote health awareness and understanding, and adoption of healthier lifestyle behaviors and personal health responsibility among its 25,574 employees. The aims of the current study are to: 1) determine the prevalence of obesity and other risk factors for cardiovascular disease and type 2 diabetes among BJC employees through a series of free, on-site health screenings; and 2) assess the feasibility of implementing a variety of environmental changes and engaging employees' participation in health promotion activities across BJC HealthCare[SM] hospitals and service organizations. Health screenings with measurements of lipids, glucose and blood pressure were completed on more than 10,000 employees. Analysis of a subset of these employees (n=4360, 77% female) reveals a high prevalence of overweight and obesity (68% of employees assessed), elevated blood pressure (63%), elevated total cholesterol (48%), and elevated fasting glucose (43%). Activities implemented thus far include an on-line health risk assessment (completed by 10,437 employees in 2003, and 16,478 in 2004), numerous healthy modifications to the hospital cafeterias, lunch and learn sessions with dietitians, a Health Hall of Fame sponsored by a major league baseball team (to recognize employees who have made important health changes), on-site WeightWatchers (through which 4,431 pounds were lost during the first year), health insurance discounts for utilizing smoking cessation programs, YMCA membership discounts, aspirin initiatives, and a 10,000 steps walking program. Survey results reveal a high level of interest in many program activities. In summary, numerous health literacy activities have been implemented successfully system-wide. The high prevalence of health risk factors among employees justifies a variety of corporate initiatives to promote healthier lifestyle behaviors. Ongoing health assessments will inform the direction and effectiveness of corporate health initiatives.

Title: CHANGES IN WEIGHT AND HEALTH BEHAVIORS FROM FRESHMAN TO SENIOR YEAR OF COLLEGE

SUSAN B RACETTE, PhD[1], SUSAN S DEUSINGER, PT, PhD[1], MICHAEL J STRUBE, PhD[1], GABRIELLE R HIGHSTEIN, RN, PhD[1] and ROBERT H DEUSINGER, PT, PhD[1].
[1]St. Louis, MO, United States.

Background: Physical activity and dietary behaviors adopted during college may influence the development of overweight and obesity in adulthood. The purpose of this study was to assess changes in weight status and self-reported exercise and dietary behaviors from the beginning of freshman year to the end of senior year of college. Students were recruited and assessed at the beginning of freshmen year; assessments were repeated at the end of sophomore and senior years. Longitudinal data are available for 204 students (138 females, 66 males). Body weight increased from 59.4±1.0 to 61.1±1.0 kg in females and from 72.0±1.4 to 76.1±1.6 kg in males by the end of senior year; height also increased. The majority of weight change occurred during the first two years of college, with little change after that. BMI increased from 22.4±0.3 kg/m^2 at the beginning of freshman year to 23.1±0.3 kg/m^2 at the end of senior year. As entering freshmen, 59% of students engaged in aerobic exercise regularly, 45% engaged in strength exercises, while 29% did not exercise regularly. Only 29% consumed at least 5 fruits/vegetables daily, and 49% ate fried and high-fat fast foods at least 3 times during the previous week. Fried food consumption decreased, while other parameters remained unchanged at the end of senior year. There were no relationships between change in body weight and participation in organized sports, recent exercise or dietary patterns, or living situation. In summary, our data suggest that weight gain is highly variable between students, with only a modest increase in BMI during the early college years. However, our results indicate that exercise and dietary patterns during freshman, sophomore and senior years do not meet the recommended guidelines for a high percentage of college students, which may have long-term health implications.

ASYMMETRY OF POSTURAL ALIGNMENT IN THE FRONTAL PLANE ASSOCIATED WITH TRUNK LATERAL BENDING IN STANDING AND SITTING.

Norton, B.J., Wong C., Holtzman, G. Program in Physical Therapy, Washington University School of Medicine, St. Louis, MO nortonb@wustl.edu

Purpose: Based on an assumed relationship between habitual asymmetric postures and specific types of back pain, we chose to examine the symmetry of postural alignment in several test positions. Previously, we studied postural alignment in the sagittal plane. The purpose of this pilot study was to test the hypothesis that back curvature and regional angles of inclination measured in the frontal plane differ for positions assumed after bending to the right as compared to left. **Subjects:** 17 subjects were studied, 12 women and 5 men. All subjects were right handed. **Methods and Materials:** Instrumentation: A digitizer was used to acquire 3D coordinates of various bony landmarks and of the surface of the back in the midline. Computer programs were used to calculate angles of curvature and inclination in the frontal plane. Procedures: The examiner marked 5 landmarks, C7, T12/L1 interspace, S2, left PSIS, and right PSIS. Subjects stood by the Metrecom and were asked to bend to the right. The examiner digitized each of the landmarks and then traced along the spine with the digitizer. In successive trials, subjects were asked to bend to the left while standing, bend to each side while sitting, and lean on both a right and a left armrest while sitting. Dependent variables of interest were the curvature and angle of inclination for both the lumbar and thoracic regions of the spine, and the thoracolumbar angle. **Analyses:** Means of 3 trials were used for all 5 variables. One-sample and paired t-tests were used to test for side-to-side differences between the values of each variable for each test condition. Alpha was set at .05. **Results:** Side-to-side differences in lumbar curvature for each test condition were the following: 12.4° for lateral trunk bending in standing, 10.5° for lateral trunk bending in sitting and 11.8° for leaning on an arm rest; the analogous differences for lumbar inclination were 5.3°, 4.9°, and 5.8°, respectively. Similarly, the differences for thoracic curvature were 10.9°, 7.5°, and 8.3°, and those for thoracic inclination were 4.1°, 3.6°, and 5.2°. The differences for the thoracolumbar angle were 5.3°, 5.5°, and 4.1°, respectively. All of the one-sample t-tests of the absolute difference between right and left positions were significant. Paired t-tests for the differences between right and left positions were significant for the lumbar region measurements and the thoracolumbar angle but not for the thoracic region measurements. **Conclusions:** The results of this study indicate that subjects demonstrated asymmetrical patterns of postural alignment associated with bending to the right side and to the left side for all test conditions. The differences between right and left side bending conditions were more systematic for the lumbar region and the thoracolumbar angle than for the thoracic region. Clinicians should consider examining postural alignment in a variety of positions to assess the notion that asymmetry in the frontal plane might be related to habitual postures and back pain.

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