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**DPT Research Day**

**Class of 2016**

Abstracts for Poster and

Platform Presentations

**Friday, July 22, 2016**

**8:30– 3:15 PM**

**Loosemore Auditorium**

**DeVos Campus**

**Grand Rapids, MI**

Platform Presentations

**EXERCISE- AND PSYCHOSOCIAL-BASED INTERVENTIONS TO IMPROVE DAILY ACTIVITY IN HEART FAILURE.** Bowen T, Jongekrijg L, Oberholtzer N, Shoemaker M; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** In individuals with heart failure (HF), low daily activity is associated with a poorer prognosis. Previous interventions seeking to increase daily activity in patients with HF have been largely unsuccessful, a fact that may be attributed to insufficient consideration for the psychosocial factors contributing to inactivity. The purpose of this study was to investigate the effects on HF-related outcomes using two different interventions with psychosocial components.

**METHODS:** This is a preliminary analysis of the subjects completing the first three months of a single-blind, randomized-controlled trial to measure daily activity in patients with HF and implanted Medtronic implantable cardioverter defibrillator and cardiac resynchronization (ICD/CRT) devices. Sixteen subjects with HF and ICD/CRT devices participated in the study. The subjects were stratified by age and baseline activity level before being randomized to either a control group (n=4), a daily activity feedback group with encouragement (n=6), or a health coaching group with an individualized home exercise program (n=6). The outcomes evaluated included daily activity, exercise tolerance, HF-related health status, and lower extremity functional strength. Differences between groups for baseline demographics were analyzed using the Kruskal-Wallis one-way analysis of variance by ranks for continuous variables and chi square analysis for categorical variables. The Kruskal-Wallis one-way analysis of variance by ranks was used to examine between-group differences in change values for each of the aforementioned continuous variables, and the Wilcoxon signed-rank test was used to examine change within groups from baseline to the 3-month follow-up period. Significance for all tests was set at p ≤ 0.05. **RESULTS:** In the preliminary analysis, there were no significant differences in primary or secondary outcome measures either between or within groups. Several individuals responded positively to intervention, but this was not found to be associated with treatment group. **DISCUSSION:** This study sought to examine the effects of two interventions with psychosocial components on daily activity in individuals with HF and ICD/CRT devices. Although daily activity was not significantly improved for any of the treatment groups, the researchers identified confounding factors that may have led to that result. These factors included fear of ICD discharge, magnitude of inactivity, the exercise protocol, seasonal change in daily activity, and readiness for behavioral change. The researchers propose that the subjects’ readiness for change is an important factor to address in order to improve daily activity.

**CONCLUSIONS:** Daily activity in those individuals with HF is stable over time, and although the present study incorporated both exercise and psychosocial components in the intervention, there was no effect on daily activity, perhaps because readiness for behavioral change was not accounted for in either group stratification/allocation or inclusion criteria. **ACKNOWLEDGEMENTS:** The authors wish to thank Brenda Boer, RN, of the Spectrum Health Cardiac Device Clinic for her help with subject recruitment and data collection. This study was funded by the Medtronic Cardiac Rhythm and Heart Failure External Research Program. All decisions related to study design, data collection, analysis, interpretation, and manuscript preparation were that of the authors. Medtronic review of the manuscript was strictly related to accurate representation/description of Medtronic products. The authors have no conflicts of interest to disclose.

**CLINICAL DECISION MAKING ABILITIES OF PHYSICAL THERAPISTS IN MICHIGAN TO DETERMINE THE NEED FOR MEDICAL REFERRAL.** Bilger BK, Hooker DL, Lamb CJ, Vaughn DW, Shoemaker MJ, Ginsberg W; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Physical therapist practice has changed in the last fifty years including a higher level of education, increased autonomy of practice, and legislative changes that allow direct access to physical therapy services. Despite these changes, there remains variability in state laws and reimbursement policies that restrict access to physical therapy based on an assumption that physical therapists do not have the education and training to correctly identify patients who may require medical referral. In order to address these concerns and to determine the impact of the Doctor of Physical Therapy (DPT) degree, the authors investigated the clinical decision making (CDM) abilities of physical therapists in the state of Michigan to determine if medical consultation is warranted in hypothetical patient case vignettes. In addition, the study explored whether factors such as DPT education, clinical experience, clinical specialization, clinical practice setting, and confidence influenced the CDM accuracy of physical therapists. **METHODS:** A survey instrument of 15 clinical vignettes was distributed via a snowball method to licensed physical therapists in Michigan across practice settings. The participants were asked to provide demographic and practice information. The survey also required participants to rate self-perceived competence in CDM abilities. In each vignette, the participants used key information to make a decision on the need for medical referral and the urgency of the referral. The participants then rated their level of confidence in making the referral decision. Chi-square analyses/Fisher’s Exact Tests and independent t-tests were performed to determine the relationship between accuracy, confidence, and demographic information. **RESULTS:** Two hundred five participants completed the survey. 64% of the participants had 10 or more years of experience, and 44.9% of the participants held a DPT degree. Overall, the average accuracy in determining whether medical consultation was warranted was 85.3%. Participants who held a DPT degree had a 2.7% greater mean accuracy score (p=.03) compared to those with other degrees. No statistically significant difference was found between overall accuracy and years of experience. Accuracy of participants to recognize urgent medical referral when immediate action was required was an average of 78.3%. Mean accuracy of these urgent referrals was greater in those participants who held a DPT degree (p=.02). Participants with less than 10 years of experience had a 7.2% greater mean accuracy score (p=.01) on these urgent vignettes than participants with 10 years of experience or more. Those who self-rated themselves as confident in overall CDM were more accurate (p=.05), and on 5 of the 15 vignettes, higher confidence was associated with increased accuracy. Clinical specialization and clinical practice setting were not associated with overall CDM accuracy. **DISCUSSION:** Overall, the average accuracy was consistent with previous studies. However, the current study highlights the accuracy of physical therapists’ CDM abilities across practice settings, levels of experience and levels of education. These factors had not been identified in previous studies. DPT degree positively impacts accuracy, whereas the number of years of experience does not. **CONCLUSIONS:** Overall, licensed physical therapists in Michigan across all practice settings were considered accurate in their ability to determine whether a hypothetical patient might require medical referral in clinical case vignettes that represented a variety of medical conditions. Results support that the transition to the DPT degree has prepared physical therapists to accurately determine the need for medical referral in the absence of extensive clinical experience.

**AN INVESTIGATION OF THE CLINICAL REASONING PATTERNS OF PHYSICAL THERAPISTS FOR A CERVICAL SPINE CASE PRESENTATION.** Majeske A, Phillips M, Rickfelder J, Sobeck C; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The clinical reasoning process is a multifaceted and complex component of a patient examination. Physical therapists (PTs) come from varied professional and educational backgrounds, which results in numerous clinical reasoning strategies used to determine a physical therapy diagnosis. The purpose of this study was to quantitatively measure the clinical reasoning patterns of PTs by examining which components of the clinical examination were valued for a patient case consistent with a C6 cervical radiculopathy. **METHODS:** The design of this study was a randomized survey of a patient examination case with a C6 cervical radiculopathy diagnosis. The survey was made available through Survey Monkey’s online customizable website. A contact person from each of the 24 American Physical Therapy Association accredited post-professional fellowship programs were contacted via email and asked to forward a link to their graduates that would allow them access to the survey. A total of 31 fellowship-trained PTs from 14 different programs participated in the study. Participants were asked to rank on a 5-point Likert scale (from strongly disagree to strongly agree) the importance of each component of the physical examination in establishing a diagnosis of C6 cervical radiculopathy. The mean values were calculated for each question. Responses with a mean ≥ 4.00 or ≤ 2.00 were deemed as valuable and selected for statistical analysis. Wilcoxon-Signed Rank tests were used to compare examination component means with a p-value of 0.003. **RESULTS:** Questions were grouped into eight different categories (history, observation, range of motion, special tests, joint motion assessment, myotome, dermatome, and neurological findings) in addition to being analyzed individually. The lowest overall group mean occurred in the history section (mean = 3.2078) and the highest overall mean in the dermatome testing section (mean = 4.4194). Fellowship-trained PTs valued the test item cluster for cervical radiculopathy (cervical distraction, cervical rotation <60°, upper limb tension test: general, and Spurling’s test) with an overall mean of 4.6589 as well as high emphasis on symptom provocative active range of motion (AROM) exam components. **DISCUSSION:** Given a diagnosis of C6 radiculopathy, fellowship-trained PTs placed emphasis on the neurological, dermatomal, and deep tendon reflex findings at the corresponding C6 level as part of their clinical reasoning model. Additionally, they valued provocative AROM findings as well as the test item cluster when ruling in or ruling out cervical radiculopathy as a diagnosis. **CONCLUSIONS:** The clinical reasoning processes utilized by fellowship-trained PTs when examining a cervical radiculopathy case presentation included value of neurological findings as well as symptom provocative tests. This suggests that fellowship-trained PTs utilized clinical reasoning decisions to select physical exam tests that were the most likely to stress irritated tissues or identify signs or symptoms commonly found with a radiculopathy. Future studies should be completed with a larger sample of therapists and comparisons made between fellowship-trained, residency-trained therapists with advanced certifications and general practitioners when examining a patient with the same case. **ACKNOWLEDGEMENTS:** Paul Stephenson and Sango Otieno from the Statistical Consulting Center at Grand Valley State University for their statistical expertise as well as Dan Vaughn, the Grand Valley State University Physical Therapy Department Chair, for his expertise in manual therapy.

**REHABILITATION FOLLOWING A COMPLEX ACETABULAR LABRAL RECONSTRUCTION AND REVISION OSTEOPLASTY: A CASE REPORT.** Van Hoven EL, Green MN, Walsh GR; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Over the past decade, the treatment of hip pathologies in the younger, active population has evolved tremendously. Acetabular labral tears and femoroacetabular impingement (FAI) are two increasingly recognized sources of hip pain that can be successfully treated with surgical intervention aimed at preserving the integrity and function of the hip joint. In most individuals, a labral repair is performed. However, in some unique cases, the labrum is unsalvageable due to several possible contributing factors including degeneration, fraying, prior surgical debridement, complex tearing, or natural size. In these cases, a labral reconstruction is required. The aim of the present case study is to describe the examination procedures and interventions applied in the successful rehabilitation of a patient after complex labral reconstruction and joint osteoplasty. **CASE DESCRIPTION:** The present case involves a 36-year-old female who underwent a labral reconstruction using an allograft in addition to a significant revision osteoplasty. This was preceded by an arthroscopic procedure seven years prior to repair a labral tear and FAI. During the procedure, the femoral head and neck were over-resected leading to rapid degenerative changes in the joint including the labrum. Over the course of 10 weeks in physical therapy, the patient progressed from toe-touch weight bearing using bilateral crutches to advanced functional strengthening and return to work. Intervention included the application of therapeutic exercise, manual therapy techniques, and neuromuscular electrical stimulation to facilitate gluteal activation. **OUTCOMES:** Progress measures including manual muscle testing (MMT), range of motion (ROM), the Lower Extremity Functional Scale, and the Hip Outcome Score (which has been found valid and reliable specific to labral tears, FAI, and hip arthroscopy) were utilized. At discharge, the patient had obtained functional ROM and strength which enabled her to perform many high-level strengthening activities. Outcome measures indicated 20-40% disability. However, much of this residual disability was related to recreational activities from which the physician advised the patient to abstain in order to best preserve the reconstructed joint. **DISCUSSION:** While there is a significant body of research on rehabilitation after hip arthroscopy and reconstruction, much variability remains in the recommendations of various researchers and physicians. From the present case, three main points about rehabilitation after complex labral reconstruction can be highlighted: (1) the importance of limiting hip flexor tendonitis during rehabilitation; (2) the frequent occurrence of gluteal dysfunction after hip surgery and how to address this; and (3) the importance of high-quality clinical decision making in all post-surgical rehabilitation cases. Further research is needed to develop consistent, evidence-based recommendations for rehabilitation after labral reconstruction. This will take time because labral reconstruction remains a relatively new approach in hip preservation and is used only in rare cases when arthroscopic labral repair is not effective.

**PEDIATRIC POWER MOBILITY TRAINING METHODS: A SYSTEMATIC REVIEW.** Brewis C, Hostnik L, McElroy R, Kenyon LK, Farris J; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Children with severe mobility limitations often lack independent mobility and must rely on others to help them explore their environment. Power mobility is increasingly being used to reduce the impact of restrictions in independent mobility. The purpose of this systematic review was to summarize and critically appraise the quantitative research evidence related to power mobility training methods used with children 21 years of age and younger. **METHODS:** This systematic review was conducted in accordance with the Assessing the Quality and Applicability of Systematic Reviews (AQASR) guidelines. The combined sample from included studies totaled 211 children, ages 5 months to 21 years. A research librarian-assisted electronic literature search of 17 databases was conducted in June of 2015 and again in January of 2016. A manual search was also performed. Only primary source, peer-reviewed quantitative studies were included in the review. Mixed-method studies were included if the quantitative methods and data could be isolated. Inclusion criteria were at least one subject ≤21 years of age, the use of repeatable power mobility training methods, outcomes related to power mobility training or use, and published in English. Exclusion criteria were power mobility outcomes indistinguishable from other technologies, outcomes not specifically attributed to children, and a focus on the development of technology or measurement tools. Screening, eligibility, and inclusion of studies were conducted in a triplicate process with disagreements resolved through consensus with a fourth reviewer. Data extraction was performed using the McMaster's Critical Review Form for Quantitative Studies. The Oxford Centre for Evidence-Based Medicine (OCEBM) 2011 Levels of Evidence or the Levels of Evidence for Single-Subject Research Designs (SSRDs) were used to determine levels of evidence. The scientific rigor was evaluated using a 10-criteria scale described by Medlicott & Harris. **RESULTS:** A total of 15,337 unique citations were identified in the searches. Of these, 27 met the inclusion/exclusion criteria for this review. Scientific rigor scores ranged from 2-7.8 with a mean of 3.97 and a median of 3.75. OCEBM Levels of Evidence ranged from II to IV with a total of 20 studies at a Level IV. Two SSRDs were rated at Level V. Commonly occurring concepts in power mobility training methods were identified and included incorporation of play, natural environment use, a responsive partner approach, Driving to Learn©, skills-focused training, virtual reality, and SMART wheelchair use. Identified outcomes of power mobility training or use included improvements in specific power mobility skills as well as improvements in personal-social skills, communication, mobility, and other developmental skills. **DISCUSSION:** A wide variety of power mobility training methods were utilized in the included studies. Frequency of training ranged from daily to less than once a week, and the duration of training sessions ranged from 10 to 60 minutes. **CONCLUSIONS:** Evidence related to power mobility training techniques is in its infancy. However, despite a lack of consensus on power mobility training methods, the individual studies included in this review reported that power mobility training or use may result in a range of positive outcomes without any known negative consequences or outcomes.

**THE RELIABILITY AND VALIDITY OF THE RAPID STEP UP TEST IN INDIVIDUALS WITH PARKINSON’S DISEASE AND HEALTHY ADULTS.** Conley K, Garascia C, Shefferly A, Harro CC; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Parkinson’s disease (PD) is a common neurodegenerative disorder with clinical manifestations including postural instability, bradykinesia, gait disturbances and strength decline, leading to functional limitations and a high incidence of falls. A clinically feasible outcome measure that is valid, reliable, and sensitive for assessing functional mobility in the PD population is needed to add to the current battery of gait and balance measures. The Rapid Step Up test (RST) is a salient functional performance measure with embedded strength and dynamic balance demands. The purpose of this study was to examine the test psychometric properties of the RST in community dwelling individuals with PD and healthy adults. **METHODS:** Two groups met the inclusion criteria and participated in this study: (1) 40 individuals with idiopathic PD on a stable PD medication regimen (mean age = 66.30 (8.07)) and (2) 55 age- and gender-matched healthy adults (mean age = 64.75 (8.50)). Test-retest reliability was examined by administering the RST twice over a 10-day period. Interrater reliability was examined by having three raters simultaneously time RST performance. Intraclass correlation coefficients, standard error of measurement, and minimal detectable change for RST were calculated for both cohorts. Concurrent validity was examined using Pearson correlation coefficients by comparing RST times with gait measures [10 Meter Walk Test (10MWT) and Six Minute Walk Test (6MWT)], clinical balance measures [Functional Gait Assessment (FGA) and MiniBEST], and force platform measures [Limits of Stability test (LOS), Motor Control Test (MCT), and Sensory Organization Test (SOT)]. Discriminative validity was assessed using Independent t tests to determine if there was a significant difference in RST between the PD and healthy groups. Stepwise multiple linear regression analyses assessed the relationship between RST time and age and PD characteristics. Alpha level <.05 was utilized**. RESULTS:** A significant difference in RST performance was found between PD and healthy adults (p<0.0001, T=-4.44, CI-95%= 2.88 to 7.57). Test-retest and interrater reliability were excellent in both groups (PD: ICC=0.91, 1.00; healthy: ICC=0.88, 1.00, respectively). In the PD cohort, there were moderate correlations (p<0.50) found between the RST and all gait and balance measures. Moderate correlations were found in the healthy group between RST and gait and balance measures, but weak to no correlations were found with FP measures and the 10MWT-fast. Age and stage of disease in the PD cohort significantly contributed to RST performance with age, disease stage, and duration accounting for 43% of the variance in RST times. **DISCUSSION:** The findings support that the RST is a reliable and valid measure that discriminates between a PD and healthy cohort. Persons with PD performed significantly slower than healthy adults, particularly with advancing age and disease stage. The motor and speed demands of the RST and the objective scoring enhance the sensitivity to assess functional mobility decline in PD. The moderate relationship between RST and the clinical balance measures lends support that the RST may be a sensitive measure to detect dynamic balance deficits in PD. **CONCLUSIONS:** Although the RST should not function as a stand-alone measure, this research study supports that it is a clinically feasible, valid, and reliable measure that has an additive value to the battery of established measures for assessing balance and functional mobility in persons with PD.

**SEMONT MANEUVER VERSUS EPLEY MANEUVER FOR CANALOLITHIASIS OF THE POSTERIOR SEMICIRCULAR CANAL: A SYSTEMATIC REVIEW.** Perla MJ, Weber DT, Kinne, BL; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Benign paroxysmal positional vertigo is the most common disorder of the vestibular system. Traditionally, the Epley maneuver has been used to treat posterior canal canalolithiasis, whereas the Semont maneuver has been used to treat posterior canal cupulolithiasis. However, the Semont maneuver has recently been used in cases of canalolithiasis of the posterior semicircular canal. Therefore, the purpose of this systematic review was to evaluate the effectiveness of the Semont maneuver to treat canalolithiasis of the posterior semicircular canal as compared to that of the Epley maneuver. **METHODS:** A literature search was performed in the Cumulative Index to Nursing and Allied Health Literature (CINAHL) Complete, ProQuest Medical Library, and PubMed databases using the search terms “Semont” AND “Epley” AND “randomized” AND “positional vertigo” OR “positioning vertigo” OR “positional nystagmus” OR “positioning nystagmus.” Inclusion criteria for the systematic review included the following: (1) individuals diagnosed with canalolithiasis of the posterior semicircular canal, (2) the Semont or modified Semont maneuver as the intervention, (3) the Epley or modified Epley maneuver as the comparative intervention, (4) cessation of nystagmus as the outcome measure, and (5) randomized controlled trials. The 2011 Oxford Centre for Evidenced-Based Medicine Guide was used to assess the level of evidence for all of the included studies. The methodological rigor for all of the included studies was assessed using the PEDro scale. **RESULTS:** A total of 85 articles were identified through a search of the 3 electronic databases as well as through other sources. Six of these articles met the inclusion criteria and were used in this systematic review. Of these 6 studies, 4 of them found no statistically significant differences between the Epley maneuver and the Semont maneuver at all of the follow-ups. **DISCUSSION:** Because the first step of the Epley maneuver is the Dix-Hallpike position which requires the cervical region to be passively extended 30 degrees and rotated 45 degrees, it may be unsafe to perform the Epley maneuver if an individual has cervical spine instability, a cervical disk herniation with radiculopathy, cervical myelopathy, an Arnold-Chiari malformation, a vascular dissection syndrome, a history of cervical spine surgery, a history of acute cervical trauma, rheumatoid arthritis, carotid sinus syncope, or an aplasia of the odontoid process. In addition, individuals with a history of low back pain or a herniated lumbar disk should be screened for symptom provocation as well as for sufficient range of motion before the Epley maneuver is selected. Therefore, the Semont maneuver may be a safer and equally effective treatment option for canalolithiasis of the posterior semicircular canal. **CONCLUSIONS:** In most cases, the Semont maneuver was equally as effective as the Epley maneuver at treating posterior canal canalolithiasis. In addition, the Semont maneuver may be a good alternative treatment option for patients with certain cervical or lumbar pathologies.

**3D KINEMATICS AND KINETICS OF THE OVERHEAD DEEP SQUAT IN HEALTHY MALES AND FEMALES**. Van Dyke JT, Waugh ZB, Wozniak RJ, Hoogenboom BJ, Alderink GJ; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The Overhead Deep Squat (OHDS) is a complex human movement pattern that requires a balance of mobility and stability in order to be performed optimally. A comprehensive understanding of the OHDS can be achieved by the utilization of three-dimensional (3D) biomechanical analysis. Currently, no published 3D biomechanical analysis has been performed identifying the normal multisegmental movement patterns occurring during the OHDS. Once normative data has been established, abnormal or dysfunctional movement patterns that might be observed during the OHDS can be accurately identified and corrected by clinicians. The purpose of this study was to build a representative database for normalized kinematic and kinetic variables of the OHDS. **METHODS:** Twenty-nine females and 11 males participated in this descriptive research study. All were healthy active participants between the ages of 18-35 years. Each participant performed a preliminary deep squat qualification screen and the Functional Movement Screen™ (FMS™). Kinematic data were collected during performance of the OHDS using the Vicon Motion Lab Systems 600 series motion capture system and MXT40 cameras. Two Advanced Mechanical Technology Inc force plates were utilized to record ground reaction forces and moments. A 73 marker set was used that included the Vicon Upper Limb, Plug-In Gait, and Oxford Multi-Segment Foot models. Three trials of the OHDS were performed per subject, and the data were processed using Visual 3D software. **RESULTS:** Mid-squat was defined as the lowest vertical point during the OHDS descent and the phase where the majority of peak kinematic values were measured. At mid-squat, the mean ankle range of motion was 30.1 ± 4.8° of dorsiflexion, and the knee reached a maximal mean flexion of 118.8 ± 19.1°. Maximal mean knee hyperextension was -3.4 ± 5.0°. Knee varus was greatest at initial squat and stabilized to a mean value of 10.4 ± 2.8° at mid-squat. Knee rotation was greatest at initial squat with a mean of 27.8 ± 8.5° of external rotation and approached neutral with a mean of 2.2 ± 11.6° of external rotation at mid-squat. Hip flexion was greatest at mid-squat reaching a mean of 116.9 ± 15.5°. Hip abduction was greatest at mid-squat with a mean of 19.9 ± 4.3°. Minimal changes in ankle frontal plane, hip transverse plane, and foot progression angles were found. The greatest kinematic moments occurred in relation to knee extension peaking at 0.82 ± 0.19 Nm/kg and hip extension peaking at 0.76 ± 0.18 Nm/kg. There was insufficient data to statistically compare between males and females. Reported results for this study were limited to the ankle, knee and hip, and further analysis of the pelvis, trunk, and foot is pending. **DISCUSSION:** With data describing kinematic and kinetic information for the ankle, knee, and hip during the OHDS in healthy individuals, it becomes possible to identify limitations or deviations that are difficult to visually identify and thus may not be considered. Clinicians may use such data to objectively analyze the OHDS in training and rehabilitation settings to identify limitations and address biomechanics. As expected, the greatest range in motion occurred in the sagittal plane, consisting of ankle dorsiflexion/plantarflexion, knee flexion/extension, and hip flexion/extension. However, the motions in the frontal and transverse planes are important to provide adequate motion to complete the OHDS. **CONCLUSIONS:** The results of this study offer a normative 3D representation of what occurs at the ankle, hip, and knee during the OHDS. Due to the variety of subject characteristics, these results can be used as the normative data to which future subjects can be compared across any plane of motion throughout the entirety of the OHDS.

**EMG ANALYSIS OF MUSCLES IN COLLEGE-LEVEL CLARINET PLAYING: A DESCRIPTIVE PILOT CASE SERIES.** Jongekrijg D, Pyrett E, Start E, Baker B, Alderink G, Campbell A; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Little is known about the muscle activation that occurs in performance of facial and breath support musculature while playing the clarinet. Understanding how muscles are normally activated may aid in treating and preventing injuries, enhancing performance through biofeedback, or finding the optimal position in musicians. The purpose of this study was to use sEMG to analyze muscle activity in the masseter, sternocleidomastoid (SCM), and external abdominal obliques (EO) during clarinet playing in standing position across three similar college students. **METHODS:** This study was a descriptive pilot case series. The subjects were three experienced college clarinet players from GVSU majoring in music performance. Subjects were screened by an experienced clarinetist and professor. Subjects reported practicing daily and had been playing for >10 years. A questionnaire screened subjects for inclusion/exclusion criteria. A musculoskeletal screen determined similarities/differences between players. Subjects had surface electrodes placed on bilateral masseters, SCMs, and EOs. A maximum voluntary contraction (MVC) was collected from each muscle examined. Data was collected at each muscle while playing the F major, 3-octave scale on the clarinet. EMG analysis included two different types of surface electrodes. Motional Labs Systems (MLS) software collected the data, and WINDAQ was used to image the data. MLS software filtered and rectified the data. RData2 software converted the files into a form that could be read by Microsoft Excel. Each data point from the MVCs and the dynamic playing data was imaged in Excel. The averages of the MVCs and the dynamic playing data were calculated for each muscle. The average percentage of MVC was then calculated for the dynamic playing data. **RESULTS:** There were differences in muscle activation from left to right musculature within subjects. Once normalized, these differences were minimized. However, differences remained between subjects. There were greater differences in the muscle activation of the EOs within and between players compared to the masseter and SCM. Similarities were also found between the masseter and SCM within subjects but not between subjects. **DISCUSSION:** The similarities within subjects in each masseter and SCM may be due to symmetrical positioning with equal demands. The differences between left and right EOs within each subject may be due to the clarinet weight largely being held by the right hand, requiring the left EO to accommodate. Further differences between subjects may be explained by gender, body positioning, or years of experience. **CONCLUSIONS:** This study shows there are differences in muscle activation between similarly experienced college-level clarinet players. The study was a good first step to using sEMG during clarinet playing, paving a pathway for future research to possibly focus on motor unit recruitment, biofeedback, or common activation patterns for musicians.

**THE IMPACT OF MUSCLE ENERGY TECHNIQUE ON PAIN, FUNCTIONAL MOBILITY, AND QUALITY OF LIFE IN AN INDIVIDUAL WITH LOW BACK PAIN: A CASE REPORT.** Nebel AS, Goehring M; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Low back pain (LBP) is a major cause of disability resulting in pain, reduced function, personal suffering, and societal burden in terms of health care costs and lost work productivity. It is estimated that 70-85% of people experience LBP at some point in their lives and that $50 billion is spent on treating LBP annually. Physical therapists are frequently involved in the treatment of individuals with LBP, providing a multitude of interventions to improve mobility and reduce pain. Many individuals reduce their health care expenses and recover more quickly through conservative management provided by a physical therapist. One treatment often provided by physical therapists is the Muscle Energy Technique (MET). MET currently has widespread use among physical therapists. However, there is a low quantity and quality of evidence available in the literature to support the use of MET by physical therapists to treat patients with LBP. The purpose of this case report was to describe the impact of MET usage on disability level, pain, and functional mobility in an individual with LBP treated in an outpatient physical therapy clinic. **CASE DESCRIPTION:** The patient, MR, is a 44-year-old male without a significant past medical history presenting to physical therapy two weeks after sustaining a low back injury at work. MR had a physically intensive job at a large international airport. Following the injury, MR reported severe LBP, an inability to continue working, and difficulty standing and walking. At the time of initial evaluation, MR presented with severely limited lumbar AROM in all directions, especially flexion (limited 75%), as measured by goniometry. Lumbar alignment assessed by palpation of bilateral transverse processes during lumbar flexion and extension revealed a lumbar flexion restriction with L4-L5 and L5-S1 segments stuck in extension and side-bending right (ERS right). Additionally, an assessment of pelvic girdle dysfunction with the seated forward flexion test and palpation of bony landmarks revealed a right anteriorly rotated innominate. The initial score on the Revised Oswestry Disability Index (ODI) indicated 50% impairment, and the Fear Avoidance Belief Questionnaire work subscale score (FABQW) completed retrospectively was 42 points indicating high levels of fear and pain-avoidance behavior. Treatment was provided over 2.5 weeks for 5 therapy sessions and included lumbar MET, pelvic MET, myofascial release (MFR), and therapeutic exercise targeted toward self-correction of lumbar and pelvic alignment and strengthening core musculature to increase lumbar stability. Lumbar and pelvic MET were performed while seated or supine respectively with three repetitions of 6-second isometric contractions in a controlled direction against a counter-force supplied by the therapist followed by intervals of assisted stretching into the new range of motion. **OUTCOMES:** The patient responded very well to all treatments provided. By the second session, the patient reported reduced pain to 1/10 on the verbal analog scale (VAS). By the fourth session, the patient had lumbar AROM within normal limits. By the last session, the patient had returned to work and stated having made 100% progress towards improvement. The revised ODI improved from 50% to 0%, and the FABQW improved from 42/42 to 11/42 at discharge. These measures revealed greatly reduced self-perceived disability, fear, and pain-avoidance behavior. **DISCUSSION:** The results of this case suggest that MET may provide therapeutic benefit to patients with acute LBP. MR derived significant benefit with the application of only a few applications of MET to the lumbar spine and pelvis, building support for the efficiency of this technique in managing LBP.

**MEASURING RHOMBOID MUSCLE THICKNESS IN CLUB AND INTERCOLLEGIATE OVERHEAD ATHLETES USING REHABILITATIVE ULTRASOUND IMAGING.** Lund J, Romstadt K, Roper S, Lomonaco-Harig M; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Rhomboid muscle tears can be a debilitating injury and prevent future sport participation in the overhead athlete. These tears are underdiagnosed due to the lack of sensitivity of imaging such as CT and MRI to confirm rhomboid muscle tears. Rehabilitative ultrasound imaging (RUSI) has the potential to image the rhomboids at the medial scapular border where it is susceptible to muscle tear and detachment. The purposes of this study were to: (1) determine the validity and reliability of RUSI for measuring rhomboid muscle thickness at the medial scapular border; (2) compare rhomboid muscle thickness between asymptomatic overhead athletes and adults; and (3) determine if a relationship exists between rhomboid muscle thickness and BMI, gender, age, or hand dominance. **METHODS:** This study was a quantitative data collection on a convenience sample of overhead athletes. Bilateral resting rhomboid muscle thickness at the medial scapular border was measured in 13 overhead club and intercollegiate athletes (7 females, 6 males; ages 18-21 years; mean height of 69.87 ± 3.83 inches; mean weight of 164.4 ± 29.18 pounds). Measurements were taken by three clinicians with participants prone and shoulders abducted 80-90°. Thickness was measured at the root of the spine of the scapula (point A) and at the midpoint between the spine and the inferior angle (point B). **RESULTS:** Interrater reliability ranged from poor-moderate (ICC=0.465-0.748) with highest values on the right medial scapular border for both genders. Statistically significant differences were found in muscle thickness between genders on the left (p=0.001) and right (p=0.002). Differences were found between athletic males and asymptomatic adults at point A with the non-dominant side being statistically significant (p=0.046). **DISCUSSION/CONCLUSIONS:** RUSI can be utilized to image the rhomboids in overhead club and intercollegiate athletes with poor-moderate interrater reliability. There are statistically significant, measurable muscle thickness differences between genders in overhead athletes which were detected by RUSI. **ACKNOWLEDGEMENTS:** Thank you to our faculty mentor, Mary Lomonaco-Harig; our faculty collaborators, Jon Rose and Laurie Stickler; Sango Otieno and the GVSU Statistical Consulting Center; and the student club and intercollegiate athletes who volunteered their time to participate in our study.

**PROGRESSIVE RESISTIVE EXERCISE EFFECT ON LOWER TRAPEZIUS CROSS-SECTIONAL THICKNESS AND STRENGTH.** Fall G, Griffore J, Olthoff T, Rose J; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Weakness and poor motor control of the lower trapezius often lead to scapular imbalance and improper positioning of the glenoid fossa as the shoulder is elevated. It is common for physical therapists to prescribe specific exercises for the lower trapezius in the treatment of shoulder pathologies. The purpose of this study was to examine the effect of a 10-week progressive resistive exercise (PRE) program on strength and cross-sectional thickness of the lower trapezius in asymptomatic adult populations using two commonly utilized exercises in physical therapy practice. **METHODS:** Thirty-six healthy participants were recruited from the greater Grand Rapids area to take part in the 15-week repeated measures design. Baseline (B1) muscle strength of the lower trapezius was tested bilaterally using a hand-held dynamometer, and baseline cross-sectional thickness of the lower trapezius was measured bilaterally using diagnostic ultrasound. Following B1 measurements, participants completed a 5-week period of no intervention and all measurements were repeated (B2). At this point, participants received verbal and illustrated instructions for 2 PREs (prone Y-raise and prone external rotation) designed to strengthen the lower trapezius using Thera-Band. Participants were prescribed a specific color of Thera-Band based on the Oddvar-Holten Scale. All measurements were repeated after 5 weeks of exercise (E1) and after 10 weeks of exercise (E2). Separate one-way repeated measures ANOVAs were run to identify any differences in strength and/or thickness between measurement times. A Bonferroni correction of the a-priori alpha .05 was performed to protect against type I errors with multiple post-hoc comparisons. **RESULTS:** Thirty-two individuals completed all phases of the study. There was a statistically significant increase in lower trapezius strength from baseline with completion of the PRE program after 5 and 10 weeks for right, left, and combined conditions. There was no statistically significant difference in lower trapezius cross-sectional thickness at any point during the 15 weeks for the right, left, or combined conditions. **DISCUSSION:** A 10-week PRE program designed to strengthen the lower trapezius demonstrated a significant increase in strength but not cross-sectional thickness. Prone Y-raise and prone external rotation may be utilized to improve strength in the lower trapezius. Given that hypertrophy would be expected after 6-8 weeks, it was concluded that even though strength increases, the thickness of the lower trapezius may not increase significantly. This may be due to its composition of primarily type I fibers. **CONCLUSIONS:** A PRE program specific for the lower trapezius may result in significant strength gains but no increases in cross-sectional thickness. **ACKNOWLEDGEMENTS:** Miriam Teft, BS, RDMS, RVT; and Laurie Stickler, PT, DHS, OCS.

Poster Presentations

**THE IMMEDIATE EFFECTS OF NEURODYNAMIC MOBILIZATIONS ON CHRONIC HEADACHE.** Marek M, Maurer P, Troyer C, Vaughn D, Oakes S; Grand Valley State University, Grand Rapids, MI.

**INTRODU CTION:** Headache is one of the most common disorders of the nervous system, affecting 46% of the adult population. The effect of neurodynamic (ND) mobilizations has not been formally studied. However, many authors advocate for its use. The purpose of this study was to explore and report the immediate effects of ND mobilizations with concurrent manual therapy interventions on patients presenting with a primary complaint of chronic headaches. **METHODS:** Using a test-retest design, ND mobilizations were performed in a single session on a convenience sample of 8 patients consisting of 7 females and 1 male, 30 to 65 years of age, with chronic headache ranging from 6 months to 25 years in duration. Active cervical flexion range of motion (ROM) during a seated slump test (SST) and passive elbow extension ROM during upper limb nerve tension test two (ULNT2), along with report of headache intensity and associated symptoms, were assessed before and after the intervention. Wilcoxon Signed Rank tests were performed to detect any statistical differences between baseline and post-treatment. **RESULTS:** Clinically important improvements resulted immediately after treatment for each patient as indicated by increased cervical ROM, decreased elbow flexion ROM, and decreased numeric pain rating scores. The median change in pain scores for the group decreased by 4.5 points. The median change in cervical flexion active ROM during right- and left-sided SST increased by 14 degrees and 12.5 degrees, respectively. The median change in elbow extension passive ROM during right and left-sided ULNT2 was 28 degrees and 29.5 degrees, respectively. There were no reported adverse effects of increased pain or headache following the treatment. **DISCUSSION:** Although the authors cannot state that the results were due to the ND mobilizations alone, the data suggests meaningful clinical implications for the use of this intervention for the treatment of patients with chronic headache. However, long-term effects of the treatment are still unknown. In this study, 6 of the 8 patients reported a decrease in headache intensity, 5 of the 8 patients demonstrated an increase in cervical flexion ROM and all of the patients demonstrated a beneficial change in elbow extension ROM before the onset of symptoms. **CONCLUSIONS:** This study supports the possibility that a relationship exists between altered or dysfunctional neurodynamics and the symptoms of chronic headaches. In addition, the study also provides preliminary evidence for the effectiveness of ND mobilizations in managing patients with chronic headaches. **ACKNOWLEDGEMENTS:** Stephanie Oakes, PT for her valuable contributions and influence in this study and Dr. Sango Otieno for statistical assistance.

**PREDICTIVE VALIDITY OF THE MOVE2PERFORM PROTOCOL IN COLLEGIATE SOCCER ATHLETES.** Huegel M, Robinson J, Wise C, Rose J; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Factors associated with increased injury risk in collegiate soccer athletes include prior history of injury, age, gender, and aberrant movement patterns. Move2Perform is a software-based algorithm that incorporates athlete demographics, sport, injury history, and movement screening scores to generate an injury risk profile of normal, slightly increased, moderately increased, or substantially increased. Movement screening tests include the Functional Movement ScreenTM (FMS), Lower Quarter Y-Balance Test (YBT-LQ), and dynamic hop tests. The purpose of this study was to determine if the Move2Perform software correctly categorizes athletes according to injury risk. **METHODS:** This study was a prospective cohort study that followed collegiate athletes over the course of a single soccer season. Prior to the athletic season, 10 female soccer athletes were screened using the Move2Perform protocol. Demographic data, previous history of injury, and performance on FMS, YBT-LQ, and hop tests were entered into the Move2Perform software which produced an injury risk classification for each athlete. Classifications were dichotomized into two categories, Low Risk (normal/slightly increased) and High Risk (moderately/substantially increased). The team athletic trainer tracked neuromusculoskeletal (NMS) injuries of the lumbar spine and lower extremities over the course of the athletic season. A 2x2 contingency table was created using injury data (injured/not injured) and dichotomized risk classification (Low Risk/High Risk). Data was analyzed using the Chi Square procedure. **RESULTS:** According to the Move2Perform software, subjects were categorized as at a moderately increased (n=7) and a substantially increased (n=3) risk for injury. This placed all of the athletes into the dichotomized High Risk category. Two athletes sustained a NMS injury. After correcting for cells with < 5, Chi Square analysis found no difference in injury rates between risk categories. The high risk group was found to have a relative risk of injury of 0.667 (95% CI: 0.051 to 8.6). Clopper-Pearson confidence interval (95% CI: 0.025-0.556) found that the algorithm accurately identified individuals 2.5%-55.6% of the time. **DISCUSSION:** This prospective cohort study had low participation. No subjects were classified as low risk causing difficulties for statistical analysis. The operational definition of injury was too specific and reduced the number of injuries included in the data. **CONCLUSIONS:** This pilot study provides a structure for future research. The results of this study neither support nor refute the predictive validity of the Move2Perform algorithm. The researchers are unable to recommend this tool as a predictor of injury risk based on limited research at this time.

**DIVISION I FEMALE CROSS COUNTRY RUNNERS PERCEPTION OF EATING BEHAVIORS AND ATTTITUDES TOWARDS HEALTH: A PILOT STUDY.** Morse L, Thomas M, Waggoner S, Stickler L; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The Female Athlete Triad (Triad), composed of low energy availability (EA), menstrual dysfunction, and low bone mineral density (BMD), is a complex condition that can affect an athlete both physically and psychologically. Low energy availability is thought to be at the cornerstone of the Triad. However, the factors that may impact athletes’ eating behaviors are complex and not well understood. Thus, the purpose of this qualitative study was to explore the perspectives of female collegiate cross country runners from Division I schools on eating behaviors and attitudes toward health. **METHODS:** Phenomenologic qualitative research methods were used in this study. Six NCAA Division I female collegiate cross country runners (ages 18 to 20), all attending the same university, participated in the interviews. All of the interviews were conducted individually and consisted of a semi-structured format with a flexible guide of open-ended questions. Each interview was recorded and later transcribed. Three researchers individually coded and developed themes/subthemes and then collaborated as a team to negotiate a set of themes/subthemes. **RESULTS:** Three main themes and 11 sub-themes became apparent through analysis of the transcripts of the six participant interviews. The three themes were Nutritional Views, Identity as a Runner, and Psychological Factors. **DISCUSSION:** There were consistent interactions among the themes and subthemes, and each athlete’s identity as a runner clearly had an impact on her perception of health. Many of the runners expressed the need to eat a more balanced diet. However, they found restricted options within their campus cafeteria. Time constraints, availability of nutritional content, and the belief that the diet for a runner is different than a non-athlete all played a role in the athletes making nutritional choices. Therefore, the ability for athletes to exercise control in what they consume may affect their possible awareness of caloric intake and allow for a larger focus on their performance. Overall, athletes tended to report not limiting their diets based on outside influences but only limiting themselves when food was considered unhealthy and had the potential to lead to weight gain. Furthermore, the athletes expressed the need for balance between caloric intake and expenditure. The athletes also expressed uncertainty on how to attain nutritional balance, either due to an expressed lack of either reliable nutritional sources or nutritional knowledge. Individualized education and establishing trustworthiness are important areas for health care professionals to address. **CONCLUSIONS:** The interactions that occurred between the subthemes and themes in this study demonstrated that there were multiple factors beyond nutritional knowledge influencing the athletes’ nutritional behaviors. Although these findings give some insight into the nutritional decisions in female runners that may impact the female athlete triad, clearly it is a complex issue**.**

**A QUALITATIVE SYNTHESIS OF PEDIATRIC POWER MOBILITY TRAINING METHODS.** Clark A, Koops M, Smith L, Kenyon LK, Farris JP; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Children with neurodevelopmental conditions are often limited in their abilities to use self-generated locomotor skills to explore and learn from their environment. Power mobility devices are increasingly suggested as a way to ameliorate the impact of restrictions in self-generated locomotion. The purpose of this systematic review was to critically appraise evidence from published studies that employed qualitative or descriptive research methodologies to explore power mobility training methods or techniques in children ages 21 years or younger. **METHODS:** This systematic review was conducted in accordance with the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) guidelines. A total of 18 subjects were included in the identified studies. Nineteen databases were searched in June of 2015 and again in January of 2016. Only primary source studies were included in the review. Additional inclusion criteria were as follows: (1) included at least one child 21 years of age or younger, and (2) provided a description of the methods used related to learning to operate a power mobility device. Mixed-method studies were included if the qualitative data could be isolated. Exclusion criteria included: (1) not being published in English, (2) non-peer-reviewed, (3) not reporting qualitative data, and (4) a focus on the development of technology or measurement tools. Included studies were appraised using the Critical Appraisal Skills Programme (CASP). **RESULTS:** A total of 14,300 articles were identified in the search. Four studies met the inclusion and exclusion criteria and included two case reports, one grounded theory research study, and a multiple case study design using mixed methods. The dearth of raw qualitative data presented in the studies precluded a formal inter-study thematic synthesis of data. However, commonalities among the power mobility training methods were identified. **DISCUSSION:** Using qualitative methodologies to gain insight from families and children could greatly enhance the literature and evidence related to power mobility training techniques. While reviewing articles to assess research strategies utilized, a surprisingly large portion of qualitative data gathered was “down-coded” into quantitative outcomes. **CONCLUSIONS:** Incorporating qualitative methodologies into studies exploring power mobility training methods used with children could better conceptualize the “how” and “why” of power mobility implementation within the pediatric population. Including both qualitative and quantitative aspects encourages clinicians to look at the whole child and not merely the child’s numerical representation.

**THE EFFECTS OF FOOTWEAR ON POSTURAL SWAY AND RISK OF FALLS.**

Bringer N, Broders J, Young E, Goehring M; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Non-slip socks are utilized with the intent to decrease risk of falls in medical settings, especially during ambulation or other functional tasks. Few studies have assessed the effectiveness of non-slip socks with regards to postural sway during a simulated fall.

It has been determined that footwear characteristics impact balance but how this is directly related to the rate and risk of falls is still unclear. The purpose of this study was to determine the postural sway of ambulatory subjects over 50 years of age while barefoot, while wearing non-slip socks, and while wearing athletic shoes during a simulated fall. The authors hypothesized that there would be a significant difference in the velocity of sway while subjects are barefoot, wearing non-slip socks, and wearing athletic shoes. More specifically, the authors hypothesized that non-slip socks would actually increase postural sway during a simulated fall compared to being barefoot and while wearing athletic shoes. **METHODS:** Velocity of postural sway was measured during a simulated fall on 14 healthy adults over the age of 50 using the NeuroCom Balance Platform Master. The number of subjects was over the minimum of n=12 needed to demonstrate statistical power. Each subject experienced three simulated falls with each of the three types of footwear. Barefoot was used as the control against wearing athletic shoes and non-slip socks. Hierarchical linear modeling was used to determine if there was a significant difference in velocity of postural sway between the three different types of footwear with P≤.05. This analysis controlled for the learning effect between trials. **RESULTS:** Velocity of sway while wearing non-slip socks was significantly lower when compared to velocity of sway while barefoot (p=0.0132). Velocity of sway while barefoot compared to velocity of sway while wearing athletic shoes did not significantly differ (p=0.1460). Velocity of sway while wearing non-slip socks was significantly lower when compared to velocity of sway while wearing athletic shoes (p=0.0001). **DISCUSSION:** Non-slip socks are issued as part of standard protocols in healthcare facilities to prevent falls. This study supports the continued use of non-slip socks given that velocity of sway significantly decreases when compared to being barefoot or wearing athletic shoes during a simulated fall using the NeuroCom Balance Platform Master. **CONCLUSIONS:** According to the study findings, postural sway is lowest during a simulated fall while wearing non-slip socks. Given that there is a relationship between increased postural sway and falls, this research supports the continued use of non-slip socks, especially when risk of falls is high such as during functional mobility activities and when working with the geriatric population. Further research is warranted to determine if there would be similar findings if the testing was conducted on a high fall risk population. **ACKNOWLEDGEMENTS:** GVSU Statistical Department.

**BALANCE AND GAIT TRAINING IN A PATIENT WITH DIABETES AND TRANSTIBIAL AMPUTATION: A CASE REPORT.** O’Neal J, Ozga K; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Falls are a significant cause of adverse health events, and up to 50% of community-dwelling elderly adults, aged 65 and older, report multiple falls per year. Health conditions, such as diabetes mellitus and transtibial amputation, are additional factors that can contribute to an increased risk of falls. Current research supports individualized exercise programs designed to target balance, gait, and strength deficits that influence participation and safety in community activities and activities of daily living. However, there is limited evidence regarding a multi-systems approach to treatment addressing the complexity of patient presentations with a combination of diabetes mellitus and long-standing transtibial amputation. The purpose of this case report was to explore how an individualized exercise program for gait and balance training can be effectively used as an intervention for increasing functional mobility and decreasing fall risk in a patient with diabetes mellitus and long-standing transtibial amputation. **CASE DESCRIPTION:** The patient described in this case was a 78-year-old Caucasian male who presented with complaints of gait unsteadiness, bilateral lower extremity weakness, and balance deficits. Additionally, the patient had a history of multiple comorbidities including obesity, obstructive uropathy, diabetes mellitus, peripheral neuropathy, hypertension, hyperlipidemia, coronary artery disease, congestive heart failure, diabetic nephropathy, and diabetic neuropathy. The patient had a 20-year history of right transtibial amputation secondary to clear cell sarcoma. The patient was found to have difficulty with challenges to his base of support and demonstrated functional lower extremity strength and flexibility deficits. Along with the results of outcome measures, including the Modified Clinical Test of Sensory Interaction on Balance (mCTSIB), 30-second chair stand test, tandem Romberg balance test, Timed Up and Go Test, and 10-meter walk test, these findings suggested that the patient was dependent on the visual system for balance and was at an increased risk for falls. The patient attended a total of 14 outpatient physical therapy sessions over the course of two months. Interventions included strengthening exercises for his bilateral hip, knee, and ankle musculature and flexibility training with an emphasis on his bilateral hamstrings, hip flexors, IT bands, gastrocnemius, and lumbar paraspinals. Multisensory balance training included conditions 1-4 of the mCTSIB, tandem Romberg, and single leg standing exercises. Gait training included assistive device training, stair climbing, resisted walking, and obstacle courses. Due to the patient’s multi-system health issues, educational issues including blood glucose monitoring, nutrition, lymphedema, use of assistive devices, and compliance with the home exercise program, were also addressed. **OUTCOMES:** At the conclusion of the episode of care, the patient had met 5 of 6 therapy goals and reported self-satisfaction with improvements in balance, gait, and ADL performance. The patient was discharged from physical therapy with a home exercise program focused on continued balance, strength, and flexibility improvements. **DISCUSSION:** This case report adds to the current literature, suggesting favorable outcomes using targeted and individualized exercise programs to address balance, gait, and strength deficits in a patient with multiple health conditions. Further research is needed to establish evidence regarding the efficacy of balance and gait training as an intervention for treating patients with long-standing non-diabetic transtibial amputation and comorbid diabetes.

**LOW BACK PAIN AND OSTEOPOROSIS POST-LUMBAR FUSION AND THORACIC VERTEBROPLASTIES: A CASE REPORT.** Brinker KM, Peck J; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** In 2012, 29% of adults in the United States reported low back pain with highest prevalence between the ages of 40-64. Lumbar fusion is a common procedure performed to treat degenerative and instability issues in the spine. After a fusion, adjacent segments are more prone to increased intradiscal pressure and degeneration. Vertebroplasty is commonly used to treat osteoporotic vertebral fractures and may be followed by multiple complications. The purpose of this case report was to describe and provide rationale for the evaluation and treatment of an individual with low back pain and an extensive medical/surgical history. **CASE DESCRIPTION:** The patient was a 69-year-old Caucasian female with low back pain and occasional left lower extremity pain of two months duration. She was two years post-operative L4-5 transpedicular decompression, facetectomy, transforaminal lumbar interbody fusion (TLIF), and posterolateral fusion. She also had a history of vertebroplasties at T8, 9, and 11 for compression fracture treatment. Her medical history was significant for coronary artery disease, depression, arthritis, thyroid dysfunction, fibromyalgia, osteoporosis, Crohn’s disease, and previous hepatitis A. The patient’s symptoms worsened with bending, prolonged standing, and walking more than 20 minutes. Her symptoms improved with lying down, aquatic exercise, and a home TENS unit. Functional difficulties included lifting, carrying, hair washing, yard work, and sleeping. Upon initial physical therapy (PT) evaluation, she presented with major loss of lumbar extension and moderate loss of side gliding bilaterally. Lumbar extension caused increased bilateral low back pain, left side gliding caused increased left low back pain, and right side gliding did not cause increased pain. Her initial Roland-Morris Disability Questionnaire (RMDQ) score was 16/24. The patient did not present with a clear PT diagnosis and had multiple adjacent segment dysfunctions according to magnetic resonance imaging (MRI). Interventions were based on a neutral core stability program focusing on transverse abdominis (TA) contractions during a variety of activities. She was given an initial home exercise program that was modified at each subsequent PT session. **OUTCOMES:** The patient was seen for 6 sessions over a period of 47 days. She continued to demonstrate decreased lumbar extension and side gliding range of motion with few pain changes. However, she did report no pain while on vacation during this timeframe. Her RMDQ score improved to 13/24. Although she was not discharged, the patient did not attend any more PT sessions after 6 visits and did not reply to a follow-up call. **DISCUSSION:** TA thickness was demonstrated as decreased in individuals with low back pain in a variety of postures compared to individuals without low back pain. Additionally, TA activation during upper extremity movement has been shown to decrease with age. Based on evidence within the literature, core strengthening appears to be an important aspect in the treatment of low back pain in clinical practice and was the primary intervention in this case. The patient progressed slowly and was not pain-free upon cessation of PT. Treatment of chronic low back pain has been reported as difficult within the literature, and pain-free outcomes are not easily achieved. Future research should focus on internal and external oblique muscle activity via electromyography or ultrasound during postural changes as well as further evidence on changes in low back symptoms after core stabilization and gluteal strengthening exercises. **ACKNOWLEDGEMENTS:** Thank you to Carrie Malin, PT, DPT, OCS, CertMDT and the staff at Mercy Health Hauenstein Neurosciences for assistance with this case report.

**MEASURING THE IMPACT OF INTERNATIONAL VOLUNTEER SERVICE IN HEALTHCARE PROFESSIONALS: A SURVEY.** Cody M, Houtz T, Smith B, Baker B, Leiras C; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Between 800,000 and 1,000,000 Americans participate in international volunteer and service (IVS) programs annually. College students make up the largest percentage of those participating. There has been a recent trend in research trying to identify the impact of participating in IVS experiences. This study was developed to address the current lack of literature in this area by administering online the International Volunteer Impact Survey (IVIS) created by Lough et al. (2009) to health care professionals that participated in IVS while in college. **METHODS:** The IVIS was distributed electronically to former participants of Hearts in Motion (HIM) volunteer trips via email and social media outlets. It remained open for 3 months and gathered 12 responses. **RESULTS:** Cronbach’s alpha was calculated to determine internal consistency within each subcategory of Likert scale group of questions and ranged from 0.62 - 0.95 with the only subcategory not meeting the required score of 0.70 being “global identity”. Using a Wilcoxon Two-Sample test, no statistically significant differences were found in subcategory responses between participants who responded that their profession was “physical therapist” and those who responded “other”. In a comparison between participants who reported having participated in community service in the past 12 months and those who had not, the only subcategory that had a statistically different response was “Previous Exposure to Diversity” with a Wilcoxon two-sample test score of 0.0025. **DISCUSSION:** This survey found similarities within student volunteers and health care professional volunteers, indicating that students can have similar experiences as health care professionals. This study serves as a pilot for the much needed research of professional behaviors in relationship to international volunteer experiences. **CONCLUSIONS:** Within the health care sector, there is a void of research on this topic. Therefore, more research should be conducted on the impact of IVS to further communicate the benefits and importance of such work. Although this study was not able to strongly demonstrate the impact of international volunteer experiences, it serves as a pilot, enhancing the need for further more expansive studies with control groups and perhaps qualitative information.