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**DPT Research Day**

**Class of 2017**

Abstracts for Poster and

Platform Presentations

#### **Friday, July 21, 2017**

#### **8:30– 3:30 PM**

#### **Loosemore Auditorium**

#### **DeVos Campus**

#### **Grand Rapids, MI**

Platform Presentations

**THE IMPACT OF POWER MOBILITY TRAINING ON A YOUNG CHILD WITH PELIZAEUS-MERZBACHER DISEASE: A CASE REPORT.** Barney M, Martin K, Torgerson K, Kenyon LK, Farris J; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Young children with severe neuromuscular or musculoskeletal conditions are often limited in their ability to explore and learn from their environment. Research suggests that power mobility may help to ameliorate the impact of mobility restrictions in these children, yet there is a dearth of literature related to the use of power mobility in children who have mobility limitations due to rare genetic conditions. The purpose of this case report was to explore the impact of power mobility training using an alternative power mobility device with a young child with Pelizaeus-Merzbacher Disease (PMD). **CASE DESCRIPTION:** The participant was a 2-year, 4-month old male with PMD who presented with significant delays across all developmental domains. He was dependent for all transfers and mobility and required maximal external support to sit. Power mobility training was thought to be potentially beneficial for the participant, but he was unable to be adequately positioned in an adapted ride-on-toy. Therefore, a Play & Mobility Device (a small, highly maneuverable motorized platform) was used to allow the participant to practice power mobility skills. Power mobility outcomes were assessed using the Pediatric Evaluation of Disability Inventory-Computerized Adaptive Test (PEDI-CAT), the Canadian Occupational Performance Measure (COPM), the Assessment of Learning Powered mobility use (ALP), and the Wheelchair Skills Checklist (WSC). Power mobility training in an individualized, engaging environment designed to elicit specific basic power mobility skills was provided for 45 to 60 minutes per week for 18 weeks. **OUTCOMES:** Over the intervention period, the participant progressed from driving using a single-switch for the first 3 intervention sessions to using a joystick for the remaining sessions. Post-intervention scores on the PEDI-CAT showed significant improvement in the Social/Cognitive and Daily Activities domains. Significant improvements were also noted on the COPM in both performance and satisfaction. The participant also progressed from an ALP Phase 3: Beginner at the onset of intervention to an emerging Phase 5: Sophisticated Beginner at the end of the intervention period. He was further able to perform 2 of 7 skills on the WSC and showed emerging competence in 3 additional WSC skills. **DISCUSSION:** The participant in this case appeared to make improvements in his power mobility skills and further demonstrated significant improvements on select domains of the PEDI-CAT. Future research is needed to explore the impact of power mobility training in children who have PMD and other rare genetic conditions.

**POWER MOBILITY ACCESS AND TRAINING FOR A CHILD WITH SPASTIC ATHETOID CEREBRAL PALSY: A CASE REPORT.** Calkins T, Niles P, Omiljan S, Kenyon LK, Farris J; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** The combination of power mobility and access methods enables individuals with severe physical disabilities to achieve independent mobility and positively impacts psychological development and wellbeing. Limitations to achieving access include matching without consideration of physical ability, environment, or social context; clinician unfamiliarity; and lack of acceptance of current access devices. The purposes of this case report were to 1) determine power mobility access for a child with spastic athetoid cerebral palsy, and 2) once successful access was found, provide power mobility training using the identified access device. **CASE DESCRIPTION:** The participant was a 10-year-old boy with spastic athetoid cerebral palsy. At the time of this case report, the participant required maximal physical assistance for toileting but was content for bowel and bladder. He was enrolled in regular education and received consultative physical therapy and occupational therapy in the classroom as needed. He was at grade level in reading and slightly below grade level in math, but he was able to keep up with his classmates academically. He was functioning at a Gross Motor Function Classification System (GMFCS) Level V, Manual Ability Classification System (MACS) Level V, Communication Function Classification System (CFCS) Level II, and Eating and Drinking Function Classification System (EDFCS) Level I. Tools utilized included the Canadian Occupational Performance Measure (COPM), Pediatric Evaluation of Disability Index - Computer Adaptive Test (PEDI-CAT), Assessment of Learning Powered mobility use (ALP), and Wheelchair Skills Checklist. The intervention consisted of power mobility training in an engaging environment that was set up to focus on power mobility skills including navigating hallways, doorways, and obstacles. Access to the power wheelchair trainer was provided via switches embedded into a bite splint device. The engagement and motivation activities were chosen based on the participant’s interests which were gathered using the Reinforcement Assessment for Individuals with Severe Disabilities (RAISD). Intervention was performed weekly for 12 weeks for 45 to 60 minutes. **OUTCOMES:** Pre- to post-intervention performance on the COPM demonstrated that the participant had an average change in performance score of 6.4 and an average change in satisfaction of 1.4. Using the standard error scores to determine pre- and post-intervention changes on the PEDI-CAT, the only significant change occurred in the Social/Cognitive domain. Post-intervention findings indicated that the participant had progressed from Phase 4: Advanced Beginner to Phase 7: Proficient on the ALP. The participant was able to perform 6 out of 7 skills on the Wheelchair Skills Checklist. **DISCUSSION:** Access to power mobility was found via a customized Bite Splint Device. The participant proved to be a competent driver as evidenced by his improvement in all driving-based outcome measures. Clinicians should become familiar with technology advancements and be confident in skills for evaluation and assessment of individuals who may benefit from power mobility. Further research is needed across ages and diagnoses.

**OBJECTIVE IMPROVEMENT IN DAILY PHYSICAL ACTIVITY IN HEART FAILURE REMAINS ELUSIVE: A SYSTEMATIC REVIEW.** Hart J, Tresh T, Wood T, Shoemaker M; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Heart failure (HF) currently affects at least 6.5 million people in the United States, and the prevalence is expected to rise. Exercise is an accepted component of HF intervention, and daily physical activity (PA) has been established as an important factor in HF outcomes. The purpose of this study was to comprehensively review the literature for exercise- and psychosocial-based rehabilitation interventions for improving daily PA in patients with HF. **METHODS:** A search of the PubMed/MEDLINE, CINAHL, ProQuest Medical, PsycINFO, and Web of Science databases was conducted. Articles were included if they 1) were written in English, 2) included subjects with HF, 3) assessed physical or psychosocial rehabilitation interventions to improve daily PA, and 4) measured daily PA qualitatively or quantitatively. Case reports, non-peer-reviewed research, and articles without full text available were excluded. Two authors completed the screening independently, and conflicts were resolved by a third author. **RESULTS:** 1,462 unique records were identified and of these, 47 were selected for full-text review. Ultimately, 15 were included: 13 randomized controlled trials and 2 case series published from 1999 through 2016. Ten studies used only exercise interventions, 3 studies used only psychosocial interventions, and 2 studies used both exercise and psychosocial interventions. **DISCUSSION:** No studies using only exercise interventions resulted in objective increases in daily PA. All 3 studies using only psychosocial interventions resulted in an increase, but 2 of these were subjective and 1 was a case series. One study using a combination of exercise and psychosocial interventions showed an objective increase, but that result was not replicated later in a similar study. **CONCLUSION:** Exercise interventions alone do not result in improvement in daily PA in patients with HF. Further investigation concerning psychosocial interventions with objective outcome measures is warranted.

**CLINICAL INSTRUCTORS’ PERCEPTIONS OF EFFECTIVE CLINICAL INSTRUCTOR BEHAVIORS.** Roberts B, Schweitzer B, Strong W, Ozga K; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Clinical education is essential for preparing physical therapist (PT) students to enter professional practice. In PT education, students are typically supervised by a clinical instructor (CI) who is an employee of the clinical site. Studies have explored student perceptions of effective CI behaviors. However, the extent to which CI perceptions agree with those of current PT students is unknown. The purpose of this study was to identify the perceptions of CIs regarding the importance and frequency of CI behaviors and to compare these findings to the perceptions of Doctor of Physical Therapy (DPT) students in a previous study. **METHODS:** This study was a cross sectional survey that was modified from the 2016 Ozga et al. study of DPT students. The participants were 499 licensed PTs who had served as a CI to a DPT student in the past 3 years. An online survey, hosted in Survey Monkey, consisted of 43 previously identified CI behaviors in 4 categories: communication, interpersonal relations, professional skills, and teaching behaviors. Using a 4-point scale, participants rated the behaviors for importance and how frequently they exhibited each behavior. Lower ratings indicated greater importance and frequency. Additional questions addressed inclusion criteria and demographics. Means and standard deviations were calculated for the ratings of importance and frequency, and the behaviors were ranked based on the means. Weighted averages were calculated for each behavior category in order to rank each category relative to the other categories for both importance and frequency. A Spearman correlation analysis was calculated for importance and frequency of each behavior to determine the degree of association between the two variables (p<0.05). **RESULTS:** Mean ratings for the importance of the CI behaviors ranged from 1.04 to 2.71, with standard deviations ranging from 0.20 to 0.86. Mean ratings for the frequency of the CI behaviors ranged from 1.05 to 2.26, with standard deviations ranging from 0.21 to 0.92. Based on weighted average rank, CI behaviors in the category of interpersonal relations were rated by respondents as most important followed by communication, professional skills, and lastly, teaching behaviors. The same order of rankings was found for the perceived frequency of behaviors. A significant positive correlation between importance and frequency was found for all 43 CI behaviors. **DISCUSSION:** A comparison of the results of this study to those of Ozga et al, indicated that both CIs and DPT students rated CI behaviors in the category of interpersonal relations as most important followed by the categories of communication, professional skills, and teaching behaviors. For both CIs and DPT students, the category rankings for frequency that behaviors were exhibited mirrored the importance rankings. These findings suggest that CIs and DPT students value similar CI behaviors and have similar perceptions regarding the frequency with which these behaviors are exhibited. The positive correlation found between importance and frequency ratings by CIs suggest that CIs believe that they are able to exhibit the behaviors they believe to be important during a clinical education experience. **CONCLUSION:** This study found that interpersonal relations and communication behaviors were the most important and the most frequently exhibited CI behaviors as rated by CIs. When comparing these findings to Ozga et al., agreement was found between the perceptions of CIs and DPT students for both importance and frequency of effective CI behaviors.

**COMPARING BALANCE PERFORMANCE ON FORCE PLATFORM MEASURES IN INDIVIDUALS WITH PARKINSON’S DISEASE AND HEALTHY ADULTS.** DeWitt A, Hargis C, Kelch A, Harro CC; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Postural instability is a known contributing factor to balance dysfunction and increased fall risk in those with Parkinson’s disease (PD). The NeuroCom Force Platform System (FP) can provide objective, quantitative information regarding balance impairments in voluntary and reactive postural strategies and sensory strategies. The purpose of this study was to examine balance performance as measured by the Limits of Stability (LOS), Sensory Organization Test (SOT), and Motor Control test (MCT) utilizing the FP system in persons with PD as compared to age-matched healthy adults. Secondarily, this study will examine if these FP measures provide diagnostic and clinically meaningful information about the underlying balance impairments in the PD population. **METHODS:** Forty-two individuals for the PD cohort (H&Y stage = 2.33 ± 0.77) and 55 individuals for the age-matched healthy cohort enrolled in this study. Balance measures (SOT, MCT, LOS) were assessed in both cohorts using standardized procedures on the FP system. Between group comparisons of FP performance were conducted using Independent t-test as well as ANCOVA controlling for age. Within group comparisons for the PD cohort were performed using the ANOVA for comparing disease stage and age group and the Mann Whitney U Test for comparing PD subtypes. **RESULTS:** Significant between group differences in FP performance were found for the SOT composite equilibrium (P = 0.013, CI-95% = 1.286 to 10.37), SOT vestibular ratio (P = 0.027, CI-95% = 0.12 to 0.185), SOT number of total falls (P = 0.015, CI-95% = -1.527 to -0.175) and LOS average movement velocity (P = 0.001, CI-95% = 0.597 to 1.595). ANCOVA analysis estimated that on average, the healthy cohort scored 5.28 points higher in SOT composite equilibrium than the PD cohort. Within group analysis revealed significant differences in FP performance based on age, stage, and PD subtypes. **DISCUSSION:** Individuals in the PD cohort demonstrated greater postural instability on SOT measures and slower movement velocity on LOS than the healthy cohort, suggesting that these tests were sensitive to detecting sensory integration and voluntary postural control deficits in the PD cohort. The SOT differentiated between H&Y stages 1-3, supporting the use of the SOT to identify decline in sensory processing and integration with advancing disease stage. The MCT was able to detect changes in reactive postural control mainly in later disease stages. The LOS and MCT distinguished between PD subtypes with the postural instability and gait difficulty subtype demonstrating poorer balance performance than the tremor dominant. These findings suggest that FP measures may provide clinically meaningful, diagnostic information in the examination of balance impairments in individuals with PD. **CONCLUSION:** In response to the high fall rate and devastating sequelae of falls in individuals with PD, FP measures may inform clinicians regarding intrinsic balance deficits and guide them in designing targeted balance interventions to reduce fall risk. **ACKNOWLEDGEMENTS:** We would like to thank Dr. Sango Otieno for his statistical expertise during this research project.

**EFFECTIVENESS OF VESTIBULAR REHABILITATION ON CONCUSSION-INDUCED VERTIGO: A SYSTEMATIC REVIEW.** Bott JL, Cron NM, Iaquaniello RL, Kinne BK; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Dizziness is one of the most common symptoms that cause individuals to seek health care services. Although vestibular rehabilitation was originally designed to treat individuals with vestibular dysfunctions, several non-vestibular issues have also been treated with this type of therapy. One medical condition that may not stem from a vestibular origin is a concussion, also known as a mild traumatic brain injury. The purpose of this systematic review was to investigate the effectiveness of vestibular rehabilitation on concussion-induced vertigo. **METHODS:** Those databases that were utilized for search terms included CINAHL Complete, Proquest Medical Library, and Pubmed. The search terms were “concussion” OR “brain injury” OR “head injury" AND "vestibular rehabilitation" OR "vestibular therapy" AND “vertigo”. The inclusion criteria encompassed the following: (1) individuals with vertigo induced by a concussion, (2) an intervention group that received vestibular rehabilitation, and (3) outcome measures that assessed vertigo. The Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence system was used to assess the evidence level of each included study. Methodological rigor was assessed utilizing criteria set forth in a systematic review by Medlicott and Harris. **RESULTS:** Nine hundred twenty-nine articles were identified through an electronic database search, and two additional articles were identified through other sources. Five articles met the inclusion criteria and were included in the qualitative synthesis. In general, four of the five studies demonstrated that vestibular rehabilitation is an effective intervention for individuals with concussion-induced vertigo. The other study showed that the presence of visual disorders does not preclude individuals from experiencing the positive effects of this type of therapy. **DISCUSSION:** It is important to note that some exceptions did occur in three of the studies. One of the pre-test/post-test cohort studies showed that there was no significant difference in scores from pre-test to post-test according to the Vertigo Coping Questionnaire, due to the possibility that the participants began using coping strategies prior to the beginning of the vestibular rehabilitation program. The randomized controlled trial showed that there was no significant difference in scores between the participants who were medically cleared to return to sport and those who were not according to the Activities-Specific Balance Confidence Scale and the Motion Sensitivity Quotient, due to the possibility that the sample size was too small. The case series showed that the difference in scores from pre-test to post-test for one of the participants did not exceed the known smallest detectable change when the Dizziness Handicap Inventory or the Vertigo Symptom Scale was used. The authors proposed that the poorer outcome was due to the fact that this participant experienced cervical pain and sustained a more serious head injury compared to the other participants. **CONCLUSION:** The results of this systematic review demonstrated that, in general, vestibular rehabilitation is an effective intervention for individuals with concussion-induced vertigo, even in the presence of visual disorders. Therefore, vestibular rehabilitation should be considered as a component of the plan of care for individuals who experience vertigo following a concussion.

**THE EFFECT OF FATIGUE ON BALANCE IN INDIVIDUALS WITH MULTIPLE SCLEROSIS**. Cline K, O’Connell R, Rudolph M, Baker B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Fatigue and impaired balance are two of the most common symptoms of Multiple Sclerosis (MS). Central fatigue experienced by people with MS differs from peripheral fatigue experienced by the general population in that it encompasses general physical exhaustion as well as difficulty with mental tasks. Central fatigue has been shown to follow a circadian variation in the MS population with greater fatigue experienced in the evening. The purpose of this pilot study was to determine the feasibility of using this known variation in fatigue level to elucidate the effect of central fatigue on balance in the MS population using a standardized battery of balance tests. **METHODS:** Two participants with an Expanded Disability Status Scale (EDSS) score between 1 and 7 were recruited to participate in two same-day balance assessments at 9:00 am and 5:00 pm. Fatigue was assessed at the initial session using a Modified Fatigue Impact Scale (MFIS) and a Visual Analog Scale (VAS). The participants then completed a balance assessment consisting of the Sensory Organization Test (SOT), the Motor Control Test (MCT), and the Limits of Stability (LOS) test. In the evening session, a VAS for fatigue was administered for a second time and the participants repeated the balance assessments. **RESULTS:** Between the morning and evening sessions, both subjects demonstrated improved composite scores for the SOT; and subject one improved in latency time on the MCT. However, for the amplitude scaling of the MCT, the subjects demonstrated a decline in accuracy for both forward and backward translations. Both subjects also demonstrated a variation in reaction time during the LOS test. Subject one demonstrated a decline in composite reaction time from 3% to 30% below age-matched norms. Subject two demonstrated minor improvement in composite reaction time between the morning and evening sessions but showed a decline in reaction time from 6% to 41% below norms in the forward direction and from 8% to 26% below norms to the right. Both subjects also demonstrated a decrease in composite max excursions on the LOS. **DISCUSSION:** Given the design of this study, no conclusion can be made regarding the statistical significance of these results. However, both subjects demonstrated a significant increase in fatigue from morning to evening sessions as reported on the VAS. This result serves to support findings reported in previous studies regarding the circadian variation in central fatigue within the MS population. Therefore, this study demonstrates the feasibility of assessing the effect of fatigue on balance using the described methodology in a larger-scale study. **CONCLUSION:** Given the prevalence of fatigue and balance impairment within the MS population, further research is needed to evaluate their potential relationship in order to advance examination and treatment methods directed at decreasing the risk of falls. **ACKNOWLEDGEMENTS:** To the National Multiple Sclerosis Society Michigan Chapter.

**TWO-DIMENSIONAL VIDEO ANALYSIS OF THE EFFECTS OF THERABAND CLX NEUROMUSCULAR EXERCISES ON THE OVERHEAD DEEP SQUAT.** Huyser A, Stinson A, Suter M, Hoogenboom B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The overhead deep squat (OHDS) is a functional movement commonly used to identify movement dysfunctions as part of the Functional Movement Screen (FMS™) and Selective Functional Movement Assessment (SFMA). Currently, there is little evidence examining the effectiveness of neuromuscular exercises on improving OHDS mechanics in individuals with stability dysfunctions. The purpose of this study was to determine the effect of low-level corrective exercises using Theraband™ CLX bands on OHDS performance in individuals with a stability dysfunction as defined by the SFMA. **METHODS:** Sixty-one healthy subjects, ages 18 to 40, were recruited for the study. Subjects were taken through the FMS™ and SFMA OHDS breakout and were included in the study if their squat was categorized as a stability dysfunction according to the SFMA. Theraband™ kinesiology tape markers were placed on bony landmarks of the pelvis and lower extremities. Two-dimensional (2D) motion analysis was utilized to record a pre-intervention OHDS using frontal and sagittal views. Corrective exercises using Theraband™ CLX bands were assigned based on the OHDS deficits identified during the initial screening process. Subjects performed 3 sets of 15 repetitions of the corrective exercises at a non-fatiguing workload. Subjects were then re-recorded performing a post-intervention OHDS. All videos were analyzed using Dartfish Motion Analysis Software to measure trunk angle, knee separation distance, and squat depth for the pre- and post-intervention OHDS. **RESULTS:** Statistically significant differences were observed between pre- and post-measures of knee separation at 0° of knee flexion (P=0.013) and knee separation at 60° of knee flexion (P=0.039), indicating decreased valgus, as well as trunk to floor angle at 60° of knee flexion (P=0.020) and trunk to floor angle at full depth (P=0.000), indicating a more vertical trunk. The pre- and post-measures of full squat depth (P=0.126) and knee separation at full depth (P=0.895) were not found to not be significantly different. The effect sizes of the measured variables were small to medium and ranged from -0.1143 to 0.6693. **DISCUSSION:** Low level, non-fatiguing corrective exercises utilizing Theraband™ CLX bands had a positive short-term effect on OHDS mechanics in the healthy normal population recruited for the study. Limitations of the study included the homogenous nature of the subject sample as only healthy normals ranging in age from 18 to 40 were recruited. Also, the study did not utilize a control group. Therefore, any improvements observed in the post-intervention squat cannot be attributed to the interventions alone. **CONCLUSION:** Although statistically significant changes were found in multiple measures, it is questionable whether these changes would be clinically significant in a physical therapy or sports performance setting. The statistically significant changes observed in the study only equated to a two degree difference at most and may not be large enough to identify without use of 2D motion analysis. However, since the OHDS is a dynamic movement, it is possible that subjects demonstrated clinically significant improvements that were not measurable using 2D motion analysis. **ACKNOWLEDGEMENTS:** Special thanks to Dr. Gordon Alderink, Professor Jon Rose, and Dr. Paul Stephenson.

**PREDICTIVE VALIDITY OF THE MOVE2PERFORM PROTOCOL TO IDENTIFY INJURY RISK IN COLLEGIATE ATHLETES.** Avery A, Sjoerdsma D, Smith C, Rose J; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Athletes who participate in intercollegiate sports are subject to rigorous physical demands that predispose them to injury. The Move2Perform (M2P) protocol is a commercially available software program that was developed to predict injury risk based on athlete characteristics and performance in a battery of movement screens. Although one study has explored the predictive validity of the M2P protocol, relatively little research has been completed on this widely used product. The purpose of the current study was to determine if the commercially available M2P software accurately categorizes athletes according to injury risk. **METHODS:** The study utilized a prospective cohort design. The participants included 21 soccer and 13 cross country athletes competing at an NCAA Division II institution in West Michigan. Soccer and cross country athletes performed the Functional Movement Screen (FMS), Y-Balance Test for the Lower Quarter (YBT-LQ), and hop tests prior to the start of their respective sports seasons. Athlete characteristics and movement screen scores were then entered into the M2P software to categorize athletes into four injury risk classifications (Optimal, Slight, Moderate, and Substantial). Athletic trainers tracked sports-related musculoskeletal (MSK) injuries throughout the 2015 and 2016 soccer and cross country seasons and reported injury data to researchers. Observed injuries were plotted with dichotomized injury risk categories (optimal + slight = low risk; moderate + substantial = high risk) in a 2x2 table. Fischer’s Exact Test was used for the primary comparison of injury risk classification and injury status to determine the predictive validity of the M2P protocol. Mantel-Haenszel Common Odds Ratios, sensitivity, specificity, and likelihood ratios were calculated. Analyses by sport and by comparison of substantial risk athletes to all others were also conducted. The alpha level used to determine significance was α = 0.05. **RESULTS:** M2P software categorized 30 of 34 athletes as moderate or substantial risk. Ten athletes sustained a MSK injury. Injury risk classification was not significantly associated with injury status in the full sample (p = 0.564), when conducted by sport (soccer, p = 0.531; cross country, p = 1.000), or with comparison of substantial risk athletes to all others (p = 0.704). Mantel-Haenszel Common Odds Ratios did not achieve significance in any of the analyses and varied from 0.250 to 1.667. The sensitivity of the M2P protocol ranged from 8.3% to 100%. Specificity ranged from 7.69% to 80%. The positive likelihood ratio ranged from 0.81 to 1.20. The negative likelihood ratio ranged from 0.00 to 3.25. **DISCUSSION:** The M2P protocol was not accurate in identifying injury risk in this sample. The trend was toward false positive findings, prospectively categorizing Moderate or Substantial injury risk to individuals who did not sustain a MSK injury over the course of the season. There are many factors that contribute to injury risk, including chance. Sports medicine professionals must acknowledge that extrinsic risk factors for injury and chance cannot be accounted for in a screen. Until more research is conducted to establish the predictive validity of the M2P protocol, sports medicine professionals should exercise caution when using injury risk classifications as the basis for medical or training decisions. **CONCLUSION:** The M2P protocol is not a valid screening tool for predicting injury in NCAA Division II collegiate soccer and cross country athletes.

**VALIDATION OF A SURVEY FOR PHYSICAL THERAPISTS REGARDING RETURN-TO-SCHOOL IN YOUTH POST-CONCUSSION.** Hanisko JM, Hoyt AK, Hull BJ, Peck J; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Concussion can significantly impact a student’s success in the classroom. Appropriate academic accommodations and return-to-school progression post-concussion are determined by a healthcare team. Physical therapists are identified as members of a concussion management team. However, current literature does not specify the requisite knowledge and perceptions of physical therapists regarding returning a student back to school post-concussion. The purpose of this study was to construct and validate a survey tool that explores physical therapists’ knowledge and perceptions of concussion and return-to-school in youth (K-12). **METHODS:** The initial survey was developed by three doctorate of physical therapy students at Grand Valley State University (GVSU) using past research on concussion and return-to-school as a means for developing questions. Faculty members in the departments of physical therapy, occupational science and therapy, and movement science at GVSU reviewed the initial survey and provided feedback based on clarity of questions by stating to either “keep”, “change”, “combine”, “delete”, or “add” questions. Simultaneously, experts in the field of concussion, pediatrics, or both were recruited from multiple healthcare professions via purposive and snowball methods. A two-round Delphi process was then used to validate the survey. The first round asked experts to select “keep”, “change or reword”, “combine”, or “delete” and to provide qualitative feedback on their selection. The experts also had the opportunity to add additional questions and provide overall feedback. Two authors reviewed feedback for each question and determined whether the question should be retained, changed, combined, deleted, or added. The second round of the Delphi process asked experts to rate each question on a 3-point scale (“essential”, “relevant but not essential”, and “not relevant”). A formula developed in previous research was used to calculate the required content validity ratio (CVR) for question retention. **RESULTS:** During round one of the Delphi process, 18 of the 30 (60%) expert panel members reviewed the original 31-item survey. Based on expert feedback, 10 (32%) questions were retained without change, 18 (58%) were reworded, 3 (10%) were deleted, and 4 new questions were added resulting in a round two survey with 32-items. Of the 18 expert panel members who responded in round one, 14 (78%) responded in round two. A CVR of 0.51 or greater was required based on number of respondents in round two. Four of the 32 questions had a CVR of less than 0.51 (p>0.05) and were deleted. This resulted in a final 28-item survey. **DISCUSSION:** The result of this study was a survey tool that consists of 28 items covering the domains of physical therapists’ (1) general knowledge of concussion, (2) knowledge of cognitive rest, (3) knowledge of academic accommodations, (4) case-based knowledge, and (5) perceptions of cognitive rest post-concussion. The round one survey was modified to address HIPAA and FERPA, classes requiring physical exertion, referral and scope of practice, and use of protocols. Round two questions that were deleted related to professional scope of practice, referral, and awareness of protocols. A main consensus among experts was that patient individuality should be respected and no strict protocols should be used when returning a youth to school post-concussion. **CONCLUSION:** This survey will serve as a valid tool in assessing physical therapists’ knowledge and perceptions of cognitive rest and academic accommodations in youth post-concussion.

**PHYSICAL THERAPY FOR COCCYDYNIA: A RETROSPECTIVE STUDY.** Failer NW, Harlow SL, Mastbergen BM, Vaughn D; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Coccydynia refers to pain in the region of the coccyx typically felt while sitting or standing from sitting. Coccydynia is most often a consequent of a fall, but it can also occur post-partum or from repetitive microtrauma. Coccydynia may also arise from a variety of referral sources. The current literature does not provide a universally accepted method of conservative physical therapy treatment for coccydynia. The primary objective of this study was to evaluate the effectiveness of conservative physical therapy on patients with coccydynia. The secondary objectives were to describe the clinical reasoning and physical therapy treatment approaches used to manage a group of patients with coccydynia. **METHODS:** The study was designed as a retrospective analysis of quantitative outcome data to evaluate the effectiveness of physical therapy interventions on a group of patients with coccydynia. In addition, qualitative data were evaluated to highlight the decision-making processes of the physical therapist who managed these patients. Ten cases were ultimately considered for analysis in this study. Quantitative data were collected for patient demographics, pre- and post-physical therapy pain scores, functional measure score changes, and patient perceived improvement. An interview of the treating physical therapist was conducted for further insight on the clinical decision-making for this group of patients. A Wilcoxon Signed-Rank test was performed in SPSS to analyze the change in peak pain values from pre- to post-physical therapy treatment for all ten patients. **RESULTS:** A statistically significant improvement in pain scores was found from pre- to post-physical therapy treatment in patients with coccydynia (p=.011). Improvement was shown in all reported functional measures and in the patients’ perceived improvement scores. An algorithm was proposed by the authors for screening and treatment of patients with coccydynia based on the interview of the treating physical therapist. **DISCUSSION:** The results of this study suggest that conservative physical therapy is a viable option for the reduction of patient reported pain related to coccydynia, and this is consistent with the literature. In reviewing the literature for this study, it is evident that there is a need for a valid and reliable screening tool, as well as a functional outcome measure, for patients with a diagnosis of primary coccydynia. For the ten patients analyzed in the study, only eight included an outcome measure; and none of the outcome measures utilized was specific to coccydynia. **CONCLUSION**: The current literature suggests that conservative physical therapy treatment may be an effective treatment option for patients with coccydynia. Current research is lacking for the efficacy of specific physical therapy interventions, intervention dosage, and functional outcome measures related to the management of patients with coccydynia. It appears, from the results of this study, that physical therapy can be an effective option for reduction of pain and for patient perceived improvement in patients with coccydynia. **ACKNOWLEDGMENTS:** The authors wish to thank our faculty collaborators, Corey Sobeck and Gretchen Walsh, as well as Sango Otieno from the Statistical Consulting Center at Grand Valley State University.

**CLINICAL REASONING OF PHYSICAL THERAPISTS CONCERNING PATIENTS PRESENTING WITH THORACIC REGION PAIN.** Luke AN, Pedzinski DE, Ratliff AL, Sobeck C, Vaughn D, Stephenson P; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** There is a lack of research on clinical reasoning patterns of physical therapists (PTs) when determining the source of thoracic region pain. The purpose of this study was to investigate PTs’ clinical reasoning process when determining musculoskeletal (MSK) versus non-musculoskeletal (NMSK) sources of pain in the thoracic region, the system referring the pain, and their ability to make appropriate keep/refer decisions when NMSK thoracic pain was present. In addition, this study explored the influence of education level and years of clinical experience on PTs’ decision making. **METHODS:** An electronic survey consisting of 10 case vignettes was sent to licensed PTs in the United States with variable experience and specialty training. Overall, 321 completed surveys were returned. Vignettes were developed by the research team and vetted by a panel of experts. Participants were asked to consider clinical case vignettes as if patients were examined via direct access with no prior physician referral. Clinical decisions were made as to whether the symptoms presented were MSK or NMSK in origin. If the PT chose NMSK, a follow-up question was asked to select the system of referred pain. In all instances, the PTs were asked if they would keep or refer the patient. A Chi-Square test was utilized to compare the PTs’ demographic characteristics (level of education and/or years of experience) with the number of correct decisions. Additionally, a Kruskal-Wallis test was utilized to compare years of experience and highest degree earned to overall participant agreeable responses. **RESULTS:** For the MSK vignettes, 93.13% agreed with the researchers that the pain was of MSK origin, and 91.95% agreed to keep the patient. For the NMSK vignettes, 64.18% of participants agreed with the researchers that the pain was of NMSK origin, 66.18% agreed to refer the patient, and 48.0% agreed on the system of origin. No statistical significance was found between years of experience or highest degree earned (p = 0.05). **DISCUSSION:** Participants were in least agreement in determining the system of origin for NMSK cases and most agreement with MSK cases. Participants demonstrated the most agreement with vignettes 1, 5, and 7 which presented patients with symptoms of MSK origin. Participants made correct keep decisions 91.95% of the time when presented with a MSK case. In NMSK vignettes, participants agreed with the researchers less than 50% of the time when determining the system of origin in 4 out of 6 vignettes. Participants made accurate decisions when presented with an emergent case involving the cardiac system. Participants demonstrated the least agreement with vignette 3 (NMSK) which was a patient case depicting referred pain from the gastrointestinal system showing signs of a peptic ulcer. The vignette with the highest percent of agreeable responses for the system of referral that was of NMSK origin was vignette 8. **CONCLUSION:** PTs were more likely to make an appropriate clinical decision when presented with a vignette that was of MSK origin compared to vignettes of NMSK origin. This supports that PTs, despite differences in education level and years of experience, can make appropriate clinical decisions when presented with a thoracic MSK condition. However, PTs were not as likely to make the appropriate clinical decisions when presented with thoracic pain of NMSK origin. In addition, PTs were able to determine system of origin less than half of the time when presented with a NMSK case. Finally, there was no statistically significance difference between the amount of education or years of experience and the ability of a PT to make appropriate keep/refer decisions pertaining to the thoracic region.

**CLINICAL REASONING OF PHYSICAL THERAPISTS GIVEN A CASE OF UNILATERAL BACK AND BUTTOCK PAIN.** Ahrns E, Eisen E, Farrell C, Sobeck C; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** A complex clinical reasoning process is used to identify the source of mechanical low back pain because there are many possible sources and no gold standard for physical therapy examination. In addition, reliability of diagnostic imaging is poor. General physical therapy practice guidelines dictate that lumbar spine pathology should be excluded before addressing other causes of low back pain such as sacroiliac joint (SIJ) dysfunction. The clinical reasoning process utilized by physical therapists to exclude lumbar spine pathology in favor of SIJ dysfunction is unclear as well as which examination components are utilized in diagnosis selection. The purpose of this study was to investigate the clinical reasoning processes of physical therapists in interpreting the findings of a lumbopelvic patient case and selection of a primary diagnosis and secondary diagnosis. **METHODS:** Licensed physical therapists currently treating patients with musculoskeletal conditions were recruited via email distribution of a survey invitation and a paper-based patient case embedded with three diagnoses: right L5 radiculopathy/nerve root irritation, right anterior innominate rotation, and left on left forward sacral torsion. After reviewing the paper case, participants were asked to select one primary diagnosis and up to two secondary diagnoses and to rate the importance of physical examination findings using a 5-point Likert scale. Between group comparisons of the average importance assigned to specific examination findings was conducted using Mann-Whitney non-parametric tests. **RESULTS:** Analysis found that 82.1% (n=367) of participants selected a primary diagnosis from the lumbar dysfunction category and 17.9% (n=80) of participants selected a primary diagnosis from the pelvic dysfunction category. The most commonly selected primary diagnoses were right L5 radiculopathy/nerve root irritation (n=219), right anterior innominate rotation (n=43), and L5 hypermobility (n=36). Those who chose right L5 radiculopathy/nerve root irritation as the primary diagnosis assigned higher importance to examination findings of centralization and peripheralization with repeated movements (p<0.05) compared to those who chose right anterior innominate rotation, assigning higher importance to positive findings within a cluster of SIJ tests (p<0.05). **DISCUSSION:** Physical therapists may be more likely to choose a primary diagnosis within lumbar spine dysfunction rather than SIJ dysfunction when both dysfunctions are present. Two of the three embedded diagnoses, right L5 radiculopathy/nerve root irritation and right anterior innominate rotation, were identified by participants as the top two most commonly selected primary diagnoses. Right anterior innominate rotation should have been considered a secondary diagnosis due to the examination finding of centralization with repeated movement testing of the lumbar spine. **CONCLUSION:** Physical therapists may use a cluster of tests to identify the specific diagnosis of lumbar radiculopathy/nerve root irritation. Those who prioritize SIJ dysfunction over lumbar dysfunction may place less value on results of repeated movement testing. Further research should be done to determine the reliability of a cluster of tests used to guide clinical reasoning in identification of nerve root irritation when radiculopathy is not present and to determine the impact of specialty training on clinical reasoning.

Poster Presentations

**MECHANICAL DIAGNOSIS AND THERAPY (MDT) VS. TRADITIONAL PHYSICAL THERAPY IN THE TREATMENT OF MECHANICAL HEADACHES: A RANDOMIZED CONTROLLED TRIAL PRELIMINARY RESULTS.** Goedhart LD, Hofman SK, Kern EA, Vaughn DW; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The Mechanical Diagnosis and Therapy (MDT) approach is one of several treatment approaches used for patients with a mechanical headache presentation. However, there is limited research to confirm whether it is the most effective treatment in this population. The purpose of this study was to compare whether traditional physical therapy treatment or MDT treatment produced better outcomes in patients with mechanical headaches. **METHODS:** This study was a randomized controlled trial with a between participants pretest-posttest control group design. Patients received four sessions including initial evaluation, education, and individualized treatment one-on-one with an MDT credentialed physical therapist as well as an individualized home exercise program. Patients in the control group received individualized treatment chosen from a set list of interventions that are typically used in physical therapy treatment. The experimental group received MDT with repeated motions in the directional preference. Progress was measured based on the Neck Disability Index (NDI), Cervical Range of Motion (CROM) assessment, using the CROM device, pain intensity, and headache frequency. Preliminary data were pulled after visit four for the first patient in each group. Changes from visit one to visit four were calculated and compared between the patients, as well as the Minimal Detectable Change (MDC) or Minimum Clinically Important Difference (MCID). **RESULTS:** The patient in the control group experienced the greatest improvement with a decrease in headache frequency, NDI score, and headache intensity. The patient in the MDT group demonstrated a decrease in headache intensity but not frequency or NDI score. Both patients increased their sum total of range of motion. However, the values were still within the combined MDC. The two patients had several baseline differences including duration of headache and sickness impact profile score. **DISCUSSION:** Due to the fact that this study used preliminary data, the results are inconclusive at this time. Data were used after visit four due to time constraints, which may have impacted the results of this study. In addition, differences between the two patients at baseline may have impacted these preliminary results. **CONCLUSION:** Currently, the clinical relevance of these findings is inconclusive due to the lack of enough subjects to adequately power the study. This study will continue to collect data with patients receiving a total of seven visits and outcome measures reassessed at visit seven until there are enough patients to power a statistical analysis. **ACKNOWLEDGEMENTS:** This research study was completed in cooperation with the Mary Free Bed Pain Center.

**ARE GENOTYPES A PREDICTIVE FACTOR OF ANTERIOR CRUCIATE LIGAMENT RUPTURES IN FEMALES? A SYSTEMATIC REVIEW.** Lyons J, McDonald Ross C; Miller M, Stickler L; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The anterior cruciate ligament (ACL) is a collection of type I collagen fibers. It is responsible for controlling anterior movement of the tibia on the femur. Non-contact ACL injuries stem from sudden deceleration, landing, and pivoting motions introducing anterior tibial translation, tibial torsion, and valgus forces. Contact injuries usually result after a hyperextension moment with valgus stress. ACL injury incidence is 100,000 to 200,000 per year in the United States alone. There are many known risk factors associated with likelihood of ACL ruptures including neuromuscular control, biomechanics, knee morphology, and gender. Research has shown that the prevalence of ACL injury is higher in females when compared to males. Existing literature suggests the following genotypes may play a role in the incidence of ACL injuries: COL1A1, COL1A2, COL3A1, COL5A1, COL12A1, FBN2, GDF5, and matrix metalloproteinase-3 on chromosome 11q22. Therefore, the purpose of this systematic review was to determine if genotypes are a predictive factor of ACL ruptures in females. **METHODS:** A literature search in PubMed, CINAHL, and SportDiscus databases was conducted using specific search terms. Inclusion criteria for the systematic review were as follows: (1) females 45 years old or younger, (2) a contact or non-contact mechanism of injuries, (3) a complete or partial ACL injury, (4) participants involved in recreational activities and/or identified as an athlete and/or physically active, and (5) studies that investigated the relationship of specific genotypes/phenotypes found in those suffering from an ACL injury. Studies were evaluated for evidence level based on the Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence Tool. Methodological rigor of the studies was evaluated using criteria adapted from “Risk Factors for Meniscal Tears: A Systematic Review Including Meta-Analysis.” **RESULTS:** Three hundred fifty-one articles were identified through an electronic database search. Five articles met the inclusion/exclusion criteria for this systematic review. All 5 articles were classified as level 4 case control studies. The following genotypes were found to be significant and either over or under represented in those females with ACL ruptures: COL5A1variant rs12722, COL12A1 variant rs970547, interaction of COL5A1 rs12722 and COL12A1 rs970547 T+A pseudo haplotype, and interaction between MMP3 rs679620 and COL5A1 rs12722. **DISCUSSION:** The included studies suggest that there may be a genetic component to increasing females’ risk to ACL ruptures. However, these are small studies with limitations; and there are still many additional factors that increase an individual’s susceptibility to ACL injury. The genetic variants discussed in this review could be affecting the biological makeup of the ACL collagen fibers and the extracellular matrix of collagen cells, leading to a decrease in tensile strength of the ACL. Taking this information into account, the results do not support genetic testing for knowledge and prevention of ACL ruptures in the female population at this time. Future larger studies are needed to assess genotypes and the role they play in their contribution to ACL ruptures in females. **CONCLUSION:** Based on the results of this systematic review, there is low-level evidence that there may be a specific link to the genetic predisposition to ACL ruptures in the female population. Prevention of ACL injuries should continue to focus on the known risk factors including neuromuscular control and biomechanics.

**DYNAMIC BALANCE DURING PREFERRED AND FAST-PACED WALKING IN INDIVIDUALS WITH PARKINSON’S DISEASE: AN ANALYSIS OF MARGIN OF STABILITY AND MEDIOLATERAL SWAY.** Rodriguez A, Spruit E, Woodward H, Alderink G; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Falls are a frequent problem for individuals with Parkinson’s disease (PD). Functional implications associated with these falls suggest a need for further research in the area of gait and dynamic balance associated with PD. To date, few studies have investigated dynamic balance with variables such as the margin of stability and center of mass (COM) velocity, much less in individuals with PD. Therefore, the purpose of this study was to compare dynamic balance during normal and fast-paced walking between individuals with PD and healthy controls. **METHODS:** This was a prospective cohort study. Fourteen subjects with PD (5 females, 9 males; mean age, 68.1 + 7.8 years) were included in this study as well as age- and gender-matched control subjects (5 females, 9 males; mean age, 66.1 + 9.7 years). Participants walked across a 10-meter level walkway using normal- and fast-paced walking speeds. Eight MX-T40 cameras (120 Hz), Nexus motion capture software (Vicon Motion System Ltd., Oxford Metrics, UK), three AMTI (Advanced Mechanical Technology Inc., Watertown, MA) force plates, and Vicon Nexus 2.5 software were used to collect kinetic and kinematic data. The full body Plug-In Gait (PIG) model marker set was used. The mediolateral (M/L) extrapolated COM to center of pressure (COP) distance (XCOM\_COP M/L), the M/L inclination angle (COM\_COP M/L angle), and the M/L extrapolated COM to margin of stability distance (MoS M/L) were used to determine whether a difference in dynamic balance existed between the PD group and the control subjects at loading response (LR) and midstance (MS). A repeated measures ANOVA was performed to test for group and condition main effects on dependent variables. Significance was set at α = 0.05. **RESULTS:** Condition main effects were found for XCOM\_COP M/L and COM\_COP M/L angle at LR and MS for pace, with a greater mean distance and angle, respectively, during fast pace compared to normal pace. A condition main effect was found for MoS M/L at MS for pace, with a greater mean distance during fast-paced walking. A between groups main effect was found for COM\_COP M/L angle at MS, with the control subjects demonstrating a larger mean angle than the PD group. **DISCUSSION:** The current results indicate that high-functioning individuals with PD do not display many significant differences in dynamic balance variables when compared to a matched control subjects. This could be a result of gait compensations that have developed over time to improve the perceived stability of those with PD, such as maintaining the COM close to the COP. Previous research on these variables is conflicting and not definitive in this population. **CONCLUSION:** Mild differences in these variables between groups suggest that even minimally involved individuals with PD could benefit from early exercise intervention to improve balance. Further research should focus on individuals with more advanced PD and analysis of the current variables with more challenging dynamic balance tasks.

**COMPARISON OF FOUR METHODS TO ESTIMATE HIP JOINT CENTER ON NORMAL SUBJECTS IN THE CONTEXT OF GAIT ANALYSIS.** Barger WB, Gailey RT, Spitzley TM, Alderink GJ, Hickox L; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Biomechanical models created to study human movement are distinguished primarily by location of anatomical/technical markers and how joint centers are determined. Predictive and functional methods to estimate hip joint center (HJC) are commonly used in clinical gait analysis. These methods are particularly prone to marker placement and skin motion errors, which can impair accuracy in calculation of net hip joint moments and powers and in clinical interpretation. The Harrington and SCoRE methods have been shown to determine HJC locations similar to those produced using imaging methods, which are considered the gold standard. Although Davis’ method is the most commonly used, it may be the least accurate. The method proposed by Seidel is least examined. Therefore, the purpose of this study was to compare HJC location derived from three predictive methods (Davis, Seidel, and Harrington) and the SCoRE functional method. Secondly, sagittal and frontal plane net hip moments during stance phase of gait, as determined by each method, were examined for differences. **METHODS:** Twenty-four healthy subjects, aged 19 to 26, participated. Prior to data collection, demographic information and body anthropometric measures for use in HJC predictive equations were obtained. Kinematic data were collected during walking trials at a self-selected pace using the Nexus motion capture software (v2.5) and 8 MX-T40 cameras (120 Hz). Two AMTI force plates (1200 Hz) were utilized to record ground reaction forces and moments. A modified 28-marker Plug-in-Gait (PIG) model set was used. Data collection included a static standing trial, a dynamic star arc motion trial, and walking trials until 10 clean force plate strikes were collected (5 right, 5 left). Data were processed in Vicon Nexus and Visual 3D. A right-left comparison was made with paired t-tests for HJC coordinates and peak hip moments using Bonferroni corrections. Repeated one-way ANOVA was used to examine for differences in HJC location and net internal hip moments, across all methods, with Tukey corrections. **RESULTS:** Significant differences were observed in the x-, y-, and z-coordinates between all four methods that estimated HJC location (p<0.05). The mean Davis HJC coordinates were significantly medial and inferior to all other methods. The Seidel method predicted x- and y-coordinate positions with no significant differences from Harrington and SCoRE methods, respectively. There were no significant differences in sagittal plane peak hip moments. There were significant differences between left frontal plane peak hip moments at Abd1 (Davis and SCoRE) and Abd2 (Davis and SCoRE, Davis and Seidel). **DISCUSSION:** The Davis HJC locations were significantly medial and inferior to the Harrington and SCoRE methods in this study. The Harrington and SCoRE methods show no significant HJC location differences between each other, which compares similarly to results of previous studies that also demonstrate these methods to be most closely aligned with gold standard imaging measures. **CONCLUSION:** The Seidel method may be more accurate estimating the HJC than the most commonly utilized Davis method.

**THE USE OF AN ALTER G TREADMILL FOR GAIT VELOCITY IMPROVEMENT IN A PATIENT WITH A CHRONIC INCOMPLETE SPINAL CORD INJURY: A CASE REPORT.** Opdycke S, Green M; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Functional ambulation is considered one of the primary goals for those with incomplete spinal cord injuries (SCI) and can be measured using gait velocity, endurance, degree of independence, or the need for assistive device. Body weight supported treadmill training has been shown to be an effective form of treatment to improve the gait quality and velocity of those who have sustained SCIs. One of these systems, the Alter G anti-gravity treadmill, utilizes air pressure in a closed environment to create body weight support. The Alter G treadmill has been used in many orthopedic populations. However, there are limited studies on the use in neurologic populations, especially for those who have sustained SCIs. The purpose of this case report was to describe the use of the Alter G treadmill and determine the efficacy of this intervention to improve gait velocity in a patient with a chronic spinal cord injury. **CASE DESCRIPTION:** The patient in this case report was a 64-year-old female who sustained a SCI following an automobile accident at the age of 55 years old. The level of injury was C5/C6 and was classified as incomplete tetraplegia ASIA C. Patient consent was obtained prior to participation in this anti-gravity treadmill training intervention. The intervention consisted of a high-intensity training program that occurred over 7 weeks with two sessions per week. Each hour session included a 30 minute warm-up and utilized the anti-gravity treadmill for the remaining time. The anti-gravity treadmill training alternated high-intensity walking bouts for 2 to 4 minute intervals with 2 minute rest breaks for a total of four sets each. Intensity was adjusted over the 7-week time frame. Pre- and post-gait velocity performance was measured utilizing the 10-meter walk test. At the completion of the intervention phase, the use of the treadmill training was not utilized for 6 weeks; and a follow-up 10-meter walk test was obtained. **OUTCOMES:** The patient improved her intensity of use of the anti-gravity treadmill from four sets of 3 minutes at 0.4 mph to four sets of 3 minutes alternating 0.4 mph and 0.5 mph for each set over 10 sessions in 7 weeks. Body weight support assistance was set at 46%, and rest break length remained consistent throughout the intervention. Improvements during the 10-meter walk test included an increase of 0.05 m/s from 0.09 m/s pre-test to 0.14 m/s post-test. This was an improvement of 55% of her average velocity. A 6-week follow-up revealed a return of gait velocity to 0.09 m/s, the same as baseline. **DISCUSSION:** The anti-gravity treadmill was an effective treatment to increase over-ground gait velocity during a 10-meter walk test following a 7-week intervention for a patient with a chronic spinal cord injury. The patient did not meet the MCID but did meet a minimally important difference of an improvement of 0.05 m/s for her gait velocity. The patient returned to baseline following a 6-week vacation with no therapy, suggesting continued use of the treadmill training is important to maintain positive effects of the intervention.

**COMPARING THE UNIVERSAL MOBILITY COACH SYSTEM™ HARNESS AND THE NEUROCOM® SMART BALANCE MASTER HARNESS REGARDING EFFECTS ON LIMITS OF STABILITY AND SUBJECT COMFORT.** Pressley J, Schichtel R, Weston A, Goehring M; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Minimal research has been done regarding harness design and comfort and their impact on a person's movement within their limits of stability (LOS). The aim of this study was to compare two harnesses, the NeuroCom® SMART Balance Master (SBM) harness and the Universal Mobility Coach System™, on healthy adults to determine if there was a statistical difference in LOS or subject comfort using the NeuroCom® SBM. Previous studies have determined the reliability and validity of the NeuroCom® SBM LOS and have determined it has high test-retest reliability. **METHODS:** As a result of the different harness designs, it was hypothesized that there would be a difference in LOS and harness comfort. A matched pair design was used to compare the reaction time, movement velocity, endpoint excursion, maximum excursion, and directional control between the NeuroCom® harness and the Universal Mobility Coach System™. A Likert Scale was administered to the subjects after each of the harnesses was worn. The scale rated the harness that was just worn on comfort, perceived safety, ease of donning and doffing, and ease of movement. **RESULTS:** The results of the study demonstrated that there was no statistical significance in any of the five parameters measured by the LOS test. In regards to the Likert Scales, there were no statistically significant differences between the two harnesses in perceived safety and comfort. **DISCUSSION:** The results of this study determined that the choice of harness did not impact a participant’s LOS or perception of safety or comfort. Therefore, a therapist should focus more on other factors that may impact a patient’s balance. This study does provide researchers with a set of normative data that may be used in future research. **CONCLUSION:** Based on this study, in the healthy normal adult population, there were no statistically significant differences between the two harnesses regarding the impact of harness design on LOS or regarding the subjects’ perceived comfort and safety. However, further research is needed to determine if there is a statistically significant difference when using a larger sample size or when testing subjects with pathology.

**BODY WEIGHT SUPPORTED TREADMILL TRAINING AND ITS EFFECT ON ATAXIA, BRADYKINESIA, AND FUNCTION IN AN ADULT WITH DIFFUSE CHRONIC HEAD INJURY: A SINGLE SUBJECT DESIGN.** Bekker PJ, Diep J, Genther TD, Baker B; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Traumatic brain injury (TBI) is a serious health problem and a major cause for morbidity and mortality in the United States, which affects roughly 1.4 to 1.6 million Americans each year. Common impairments seen in those who have suffered a TBI can include gait and balance disturbances and symptoms such as ataxia and bradykinesia. Body weight supported treadmill training (BWSTT) has been shown to have strong evidence for recovery of gait in populations such as Stroke, Parkinson’s, and Cerebral Palsy. However, the consensus for the effectiveness of this intervention in TBI and ataxia is not as strong. The purpose of this single subject research study was to examine the effectiveness of locomotor training on gait parameters, such as ataxia and bradykinesia, using body-weight support on a treadmill and overground walking on a participant who is ambulatory without an assistive device in improving gait and daily functional abilities. **CASE DESCRIPTION:** The participant, IG, was a 26-year-old male who suffered a severe TBI and related multiple traumas secondary to a motor vehicle accident 4.5 years ago. He spent 1 week in intensive car, being placed in an induced coma with a ventilator for 3 days. He was then placed on 1-month bed rest and was subsequently admitted into inpatient rehabilitation where he received 4 months of interdisciplinary care. At the time of the study, IG was walking independently. However, he presented with significant ataxia of the arms, trunk, and legs; ataxic slurred speech; generalized bradykinesia of fine and gross movements; and impaired postural control with standing and gait. The study followed an ABAB design with a baseline phase, two intervention phases, a data collection phase between the intervention phases, and a 1-month follow-up visit. Each phase lasted 6 weeks, and the patient was seen 1x/week during the baseline and data collection phases and 3x/week during the intervention phases. The training sessions lasted 1 to 1 hour and 15 minutes and consisted of BWSTT on a treadmill and overground as well as overground training. **OUTCOMES:** The participant demonstrated an improved outcome measure score for the SARA (baseline = 11.67, 1st data collection = 7.58, 1-month follow-up = 8.5) and FGA (baseline = 5.67, 1st data collection = 8.83, 1-month follow-up = 13) but did not demonstrate a change in walking velocity (baseline = .1312 m/s, 1st data collection = .1144 m/s, 1-month follow-up= .1180 m/s). Following the intervention phases, the SARA and FGA scores fell outside of the two standard deviation bands while his walking velocity remained within the two standard deviation bands. **DISCUSSION:** This study examined the effects on the parameters of gait, including ataxia and bradykinesia, following locomotor training using BWSTT in conjunction with BWSTT overground and overground training without any support. Improvement in both gait parameters was seen in this participant. BWSTT in combination with overground training may improve gait and balance in a subject with severe ataxia secondary to TBI.