

**DPT Research Day**

**Class of 2018**

Abstracts for Poster and

Platform Presentations

**Friday, July 13, 2018**

**8:30– 4:00 PM**

**Loosemore Auditorium**

**DeVos Campus**

**Grand Rapids, MI**

Platform Presentations

**POWER MOBILITY TRAINING USING A MODIFIED HEAD ARRAY DEVICE WITH A FIVE-YEAR-OLD CHILD WITH CEREBRAL PALSY: A CASE REPORT**. Guinther K, Kuster R, Racinski K, Kenyon L, Farris J; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Power mobility has been shown to have a positive influence on a young child’s psychological, emotional, and social development by providing children with limited self-generated locomotion with a means to explore their environment. Current power mobility literature focuses on more traditional access methods such as joysticks with limited literature examining the use of non-traditional access methods such as head arrays. The purpose of this case report was to describe the power mobility training program used to help a child learn how to use a modified head array device to operate an alternative power mobility device. **CASE DESCRIPTION:** The participant was a 5-year, 6-month-old male with spastic quadriplegic cerebral palsy, Gross Motor Function Classification Level V, Eating and Drinking Ability Classification Level V, Communication Function Classification System Level V, and Manual Ability Classification System Level V. The intervention was a 15-week power mobility training program using a modified head array and the Power Wheelchair Trainer (Trainer), both of which were co-created by the Departments of Physical Therapy and Engineering at Grand Valley State University. The Trainer is a motorized platform in which the participant’s manual wheelchair is secured to mimic a power wheelchair. The power mobility training approaches included incorporating play, goal-directed mobility, and self-exploration. **OUTCOMES:** The participant completed 14 out of 15 power mobility training sessions. Improvements were observed in the Canadian Occupational Performance Measure, the Wheelchair Skills Checklist, and the Assessment of Learned Power mobility use. The participant was able to sustain forward movement, turn corners, and maneuver around obstacles using the Trainer. The participant’s driving abilities at the conclusion of the training program allowed him to qualify for a trial of a power wheelchair using a head array. **DISCUSSION:** The outcomes suggest that this intervention and approach may have been beneficial in helping the participant to improve his power mobility skills. Successful integration of a power mobility device into a child’s daily life involves a multi-faceted approach centered on coordination with the family. Further research is needed on the use of head arrays and the emotional effects associated with a child qualifying for a power wheelchair.

**POWER MOBILITY TRAINING FOR A TODDLER WITH ARTHROGRYPOSIS: A CASE REPORT.** Chapman A, Gotberg K, Hoffman C, Kenyon LK, Farris J, Chesser B; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE**: Assistive technology (AT) is widely used across the general population. However, despite growing evidence on the positive influence that AT can have on development, therapists often report underutilization of AT with young children. Highly complex forms of AT, such as power mobility devices, are used even less frequently, especially with children under the age of 36 months. The purpose of this case report was to provide power mobility training to prepare a toddler with arthrogryposis to use a trial power wheelchair in a preschool environment. **CASE DESCRIPTION**: The participant was a 2-year, 5-month old female with arthrogryposis and a medically complex history who was unable to independently move and explore the environment. The participant’s father stated that his long-term goal was for his daughter to be independent using a power wheelchair. The father further reported that although he had modified a child’s Segway for the participant to use as a power mobility device, she had limited opportunities to use this device and practice her power mobility skills. An examination was performed through observation of her functional abilities and through using the Assessment of Learning Powered mobility use (ALP), the Wheelchair Skills Checklist (WSC), the Pediatric Evaluation of Disability Inventory-Computer Adaptive Test (PEDI-CAT), and the Canadian Occupational Performance Measure (COPM) to assess baseline skills. The participant’s functional mobility was found to be significantly behind that of her peers. It was determined that she would benefit from more formalized power mobility training and use. A power mobility training program using her modified Segway device was implemented once a week for 15 weeks. Power mobility training approaches included incorporating play, goal-directed activity, and environmental exploration. **OUTCOMES**: After 12 weeks of power mobility training, the participant met the criteria to trial a power wheelchair. The trial power wheelchair was used for the final three weeks of the intervention. At the end of the training program, she was able to perform six of the seven skills on the WSC and had progressed from a Phase 3 to a Phase 4 on the ALP. The COPM showed clinically significant change for both performance and satisfaction across four of the six occupational performance problems identified at baseline. Upon post-intervention follow-up, she was reported to be successful and safe while using the trial power wheelchair in her preschool classroom. **DISCUSSION**: The participant was able to use a trial device in a preschool classroom environment following a power mobility training program. This case cannot be generalized to all children, but it may encourage clinicians to consider and use power mobility with children at an earlier age.

**THE EFFECT OF DAILY FATIGUE ON BALANCE IN INDIVIDUALS WITH MULTIPLE SCLEROSIS: PRELIMINARY FINDINGS.** Borieo A, Emens K, Ingles A, Baker B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Individuals with multiple sclerosis (MS) suffer from postural control (balance) impairments, increased levels of fatigue, and an increased risk of falls. The effect that time of day has on an individual’s fatigue and therefore balance is poorly understood. The objective of this study was to compare the effects that time of day has on patient reported fatigue and objective measures of balance in a sample of subjects with MS. **METHODS:** Four individuals with a diagnosis of MS (EDSS<7) were recruited using convenience sampling through a local MS support group. Participant characteristics and inclusion/exclusion criteria were assessed at the initial session using the Expanded Disability Status Scale (EDSS), the Saint Louis University Mental Status examination (SLUMS), and Modified Fatigue Impact Scale (MFIS). Subjects attended a morning and an evening session. The Visual Analogue Scale of Fatigue (VAS-F) was completed at the start of each session. The Sensory Organization Test (SOT), the Motor Control Test (MCT), and the Limits of Stability Test (LOS) were completed by the participants during each session using the NeuroCom SMART Equitest System to assess balance. **RESULTS:** There were no statistically significant differences found between the morning and evening SOT, MCT, LOS, or VAS-F measures analyzed. **DISCUSSION:** The small sample size did not offer an adequate representation of the population nor the ability to complete a parametric statistical analysis of the data collected. Consistent day-to-day fatigue was assumed in this study. The type and duration of MS were not controlled for in the sample group. Confounding variables between sessions may have been present, but they were unable to be accounted for. **CONCLUSION**: Although there are trends toward differences in objective measures of balance from morning to evening in individuals with MS, there were no statistically significant differences related to the independent variable of time of day. A larger sample size is required to determine the significance of findings. **ACKNOWLEDGEMENTS:** Grand Valley State University Statistical Consulting Center.

**CLINICAL INSTRUCTORS’ PERCEPTIONS OF DPT STUDENT BEHAVIORS DURING CLINICAL EDUCATION EXPERIENCES.** Fila A, Kempers L, Sudek A, Ozga K, Kenyon L; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION: S**tudents in a Doctor of Physical Therapy (DPT) program are required to complete a minimum of 30 weeks of full-time clinical education experience. This portion of the DPT curriculum is of high value in shaping a student to become a competent entry-level physical therapist. Both a clinical instructor (CI) and a student play a role in determining the outcome of the clinical experience. Prior research has explored CI behaviors that contribute to clinical education experiences. However, recent studies of the DPT student behaviors that contribute to clinical education experiences are limited. Therefore, the purpose of this study was to identify clinical instructors’ perceptions of the DPT students’ behaviors that impact clinical education experiences.  **METHODS:** This study used a qualitative framework to gather data from CIs with varying levels of experience who practiced in various types of clinical settings in west Michigan. Focus groups and one-on-one interviews were conducted. Standard questions were asked to facilitate discussion among the participants with prompts and follow-up questions posed for clarification. One-on-one interviews, using the same process, were conducted when a CI was unable to attend a scheduled focus group. Each of the focus groups and interviews were digitally recorded and transcribed verbatim. Data collection continued until data saturation was reached. Data were analyzed using the constant-comparative method. **RESULTS:** Four focus groups and one individual interview were conducted with a total of 22 participants. Seven behavioral themes emerged from the data: (1) Commitment to Learning, (2) Communication/Interpersonal Skills, (3) Professionalism/Responsibility, (4) Critical Thinking/Problem Solving, (5) Constructive Feedback, (6) Effective Use of Time and Resources, and (7) Stress Management. Each of these themes included both positive and negative behaviors. **DISCUSSION:** From the seven behavioral themes, three predominant themes emerged: Commitment to Learning, Communication/Interpersonal Skills, and Professionalism/Responsibility. These themes were consistent with the findings of previous studies of student behaviors. Some behaviors, such as questioning and confidence, were perceived as positive and negative based on the extent to which the behavior was displayed. **CONCLUSION:** Data revealed that CIs perceive that positive and negative DPT student behaviors impact a clinical education experience. These findings may assist academic and clinical educators to prepare DPT students for clinical education experiences.

**POST-CONCUSSION PHYSICAL THERAPY EXAMINATION AND INTERVENTION: COMPARING AND CONTRASTING TO CURRENT CLINICAL PRACTICE GUIDELINES: A CASE REPORT.** Little E, Chesser B; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** The prevalence of concussions is increasing in the United States. There are a variety of clinical practice guidelines (CPGs) for the examination and provision of interventions for concussions. The purpose of this case report was to compare and contrast the examination and provision of interventions for a patient with concurrent neck pain and dizziness post-concussion with recent CPGs. **CASE DESCRIPTION:** The subject was a 45-year-old female who presented to physical therapy 29 days post-concussion. The subject scored 90/100 on the Dizziness Handicap Inventory and 78/78 on the Headache Impact Test-6. Her active cervical range of motion (ROM) was limited to 20-30 degrees in all directions. The subject tested negative for nystagmus and had a normal vestibulo-ocular reflex (VOR). The plan of care was written for 12 weeks with physical therapy sessions provided two times per week. Physical therapy sessions focused on manual techniques for increasing cervical ROM, exercises for vestibular rehabilitation, and a home exercise program to regain strength. **OUTCOMES:** The subject made improvements in her cervical ROM, her tolerance to VOR exercises, and the objective measures listed above. Her plan of care was unexpectedly discontinued due to the cessation of her worker’s compensation benefits. **DISCUSSION:** Physical therapy examination and interventions did not adhere to only one CPG but instead reflected recommendations from multiple CPGs. Most CPGs provided information for general healthcare professionals regarding the observation of symptoms and the referral for specialized care.

**PHYSICAL THERAPIST DETERMINATION OF DISCHARGE DISPOSITION IN THE ACUTE CARE SETTING.** Gutowski A, Mallgren M, Oliver L, Shoemaker M, Van Dam A, McLeod J, Mohney E. Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Although physical therapist consultation in the acute care setting contributes to reduced readmission rates, the mechanism is unclear. It is also unclear the extent to which physical therapists (PTs) consider established predictors of readmission and the extent to which these predictors are associated with PT discharge (DC) recommendations. Therefore, the purpose of this retrospective chart review study was to determine whether PTs are accurate in determining home DC disposition as measured by all cause- and mobility-related readmissions and to examine the extent to which predictors of readmission are associated with PT DC disposition decision-making. **METHODS:** A retrospective medical record review was completed for 322 patients with at least one PT visit who were discharged to home from a large tertiary care teaching hospital. Demographic and clinical data were collected. Multivariate binary logistic regression with conditional backward elimination variable selection was used to determine predictors of readmission and PT DC recommendations for location, level of social support, and post-acute PT services. **RESULTS:** Of the patients who were recommended for home DC by PT, only 2 of 287 (0.70%) were readmitted and only 4 of the 287 (1.39%) returned to the emergency department (ED) for mobility-related problems. Having 24-hour social support available upon DC was the only significant predictor of all three PT DC recommendations (location, level of social support, and post-acute PT services). Otherwise, there was not extensive overlap of predictors among the regression models. A lack of specificity in the PT recommendation for “intermittent assist” was noted for the patients with mobility-related readmissions and ED visits. **CONCLUSION:** The results of the present study affirm the accuracy of PT determination of safe DC to home and although there was not extensive overlap of predictors of readmission and predictors of PT DC decision-making, the relationships among the various predictors were hypothesis-generating as to the way in which PT decision-making might help reduce non-mobility-related readmissions. When considering those patients with mobility-related readmissions and ED visits, it appears that a recommendation for “intermittent assist” without additional details may be problematic.

**DISCHARGE RECOMMENDATION CLINICAL DECISION MAKING FOR A 51 YEAR OLD MALE WITH A TIBIAL PLATEAU FRACTURE: A CASE REPORT.** Paul, NP, Hoogenboom, BH; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Hospital readmissions are a significant expense within the United States healthcare system. With many insurances no longer reimbursing for hospital care related to patient re-admittance, it is imperative that factors be analyzed regarding the considerations that influence the selection of patient discharge location. The physical therapist (PT) has a strong voice in discharge recommendations. However, no objective methodology for discharge location selection currently exists. Few studies have analyzed in-depth the factors therapists consider when generating their recommendations and the relative importance of each factor. The purpose of this case report was to examine an acute care PT’s decision-making process for recommendation regarding discharge location of a single subject. **CASE DESCRIPTION:** The subject wasa 51-year-old male who had sustained a right tibial plateau fracture in a motor vehicle accident. The fracture required external fixation before an open-reduction, internal fixation procedure could be performed at a later date.The subject was examined and treated by a physical therapist, a student physical therapist, and an occupational therapist working simultaneously and collaboratively for a total of two sessions performed on consecutive days. The final discharge recommendation, the factors influencing therapist recommendation, and the relative importance of all factors discussed by the treating therapists were discussed and recorded with findings verified by consensus among the treating therapists. **OUTCOMES:** The subject was discharged to sub-acute rehabilitation due to his inability to perform transfers, gait, ADLs, and IADLs independently. His aging parents were unable to provide adequate support for discharge to home. **DISCUSSION:** The treating therapists took into consideration the subject’s prior level of function, current physical abilities, assistance available upon discharge, home/discharge environment, prognosis, need for continued medical and rehabilitation services, co-morbidities, and preferences when formulating the discharge location recommendation. The factors that were considered when formulating the discharge recommendation are supported by previous studies. No conflict existed regarding discharge recommendation between the subject, his family, and the treating therapists or other medical providers. The treating acute care physical and occupational therapists repeatedly referenced the subject’s physical abilities, discharge environment, and assistance available upon discharge when formulating their discharge recommendation which is consistent with previous research and studies analyzing discharge planning.

**A COMPARISON OF EMG ACTIVATION IN SHOULDER GIRDLE MUSCULATURE DURING OPEN- AND CLOSED-HANDED GRIP EXTERNAL ROTATION ELASTIC RESISTANCE EXERCISE.** Dekkinga H, Huyser K, Miller E, Hoogenboom B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** External rotation using elastic resistance is one of the most commonly prescribed exercises during shoulder girdle rehabilitation by health care providers. However, very little research has examined the impact of closed- vs. open-handed grip on shoulder girdle muscular activation during this exercise. This is an important consideration with the addition to the market of a looped feature to an elastic band called “CLX band”. The “CLX band” provides the ability to attach resistance to the upper extremity without holding it in the hand. The purpose of this study was to examine the effect of hand grip on muscle activation of four shoulder girdle muscles during external rotation strengthening exercises performed against elastic resistance. **METHODS:** A sample of 20 healthy, uninjured adults between the ages of 20 and 40 (10 males and 10 females) was recruited to participate in this study. Surface electrodes were placed on the upper trapezius, biceps, lower trapezius, and infraspinatus muscles. Subjects performed seated external rotation using elastic resistance with their dominant arm using a predetermined resistance level to the beat of a metronome for three repetitions. Participants did this once using a closed-handed grip on the elastic resistance and once with an open-handed grip. The testing order was determined by a coin flip. Raw electromyographic (EMG) signals were normalized to the participant’s maximum voluntary isometric contraction (%MVIC), and some muscle ratios were investigated. **RESULTS:** Mean open-handed grip muscular activation averages were: upper trapezius 52.78%, biceps 17.31%, lower trapezius 32.46%, and infraspinatus 52.77%. Mean closed-handed grip muscular activation averages were: upper trapezius 52.76%, biceps 19.84%, lower trapezius 37.66%, and infraspinatus 58.87%. Based on the findings, the biceps, lower trapezius, and infraspinatus muscles demonstrated a statistically significant greater activation in the closed-handed condition. No difference in activation was found for the upper trapezius between the two conditions. The lower trapezius to upper trapezius ratio was 0.61 for the open-handed grip and 0.71 for the closed-handed grip. **DISCUSSION:** When prescribing external rotation exercises for patients, it is important to understand the effects that hand grip has on the shoulder girdle musculature. The results of this study indicated that when performing closed-handed external rotation, there will be greater activation in the biceps, lower trapezius, and infraspinatus compared to the open-handed grip. Using the data on muscle activation for the shoulder girdle could be clinically useful when determining what grip is appropriate for exercise prescriptions. **CONCLUSION:**  Higher muscular activation occurs during elastic-resisted closed-handed grip external rotation than in open-handed grip external rotation for the biceps, lower trapezius, and infraspinatus. Therefore, transitioning from an open-handed grip to a closed-handed grip may allow for a mild progression to the exercise. Furthermore, using an open-handed grip may be beneficial for patients post biceps lesion, SLAP lesion, and/or surgical intervention related to the biceps because there is less overall activation of the biceps with an open-handed grip in comparison to a closed-handed grip.

**EFFECTIVENESS OF DRY NEEDLING IN THE MANAGEMENT OF SHOULDER MYOFASCIAL TRIGGER POINTS: A RANDOMIZED CONTROL PILOT STUDY.**

Karlik D, Partyka K, Reyhl N, Rose J, Teft M, Zylstra E; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Myofascial pain syndrome (MPS) is a common health problem that is often marked by myofascial trigger points (MTrPs). A MTrP is a hyperirritable spot in the muscle or fascia that is painful upon compression and can give rise to characteristic referred pain. The etiology of MTrPs is unclear with evidence suggesting the cause may be related to muscular dysfunction or to a radicular phenomena. Peripheral dry needling (PDN) is a commonly utilized treatment thought to affect MTrPs via a local neuromuscular change. Segmental dry needling (SDN) involves DN of the paraspinals associated with the segmental nerve root innervating the muscle. SDN is thought to affect MTrPs by alleviating nerve root compression. The purpose of this study was to differentiate between the effects of SDN of the C4-6 paraspinals, PDN of deltoid and infraspinatus MTrPs, and sham treatment in otherwise healthy individuals with deltoid and infraspinatus MTrPs. **METHODS:** Nine healthy participants were enrolled in this double-blind, randomized controlled trial. The participants were randomly assigned to SDN, PDN, and sham needling groups. Tenderness, pain, and force production between the treatment groups were assessed pre-intervention, immediately post-intervention, and seven days after the DN intervention. Tenderness was assessed using a pressure algometer to determine the pain pressure threshold (PPT), pain was assessed using the Numeric Pain Rating Scale (NPRS), and force production was assessed using hand-held dynamometry (HHD). The non-parametric Friedman Test was used to analyze change in tenderness, pain, and force production over time. **RESULTS:** Each group had three participants. No significant between group differences on baseline outcome measures were found.Eighty-nine percent (8/9) of the participants believed they received true dry needling intervention. No significant differences were found for PPT, NPRS, or HHD when comparing baseline to immediate post-intervention, baseline to seven days post-intervention, or immediate post-intervention to seven days post-intervention. **DISCUSSION:** Based on participant perception, the sham treatment is a reasonable facsimile of DN. Lack of significant findings may be the result of a type II error due to the low sample size of this pilot study. Although the protocol is viable,further research including a larger sample size is necessary to determine the effectiveness of paraspinal dry needling at reducing pain and increasing strength in healthy individuals with shoulder MTrPs. **CONCLUSION:** This pilot study has developed a viable protocol with a reasonable sham treatment, but it found no significant changes in deltoid or infraspinatus muscles for tenderness, pain, or force production between treatment groups.

**DEVELOPMENT AND PILOT OF THE RUNNER’S HEALTH CHOICES QUESTIONNAIRE.** Arnold A, Myers S, Sampson M, Stickler L; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The Female Athlete Triad (triad) is a prevalent health issue composed of low energy availability, menstrual dysfunction, and low bone mineral density. The triad is a complex condition that can affect an athlete physically and psychologically. Female collegiate athletes, especially those involved in sports that emphasize leanness, are more susceptible to developing one or more aspects of the triad. Low energy availability has been identified as the cornerstone of the triad, yet reasons for nutritional choices among female collegiate athletes are highly complex and poorly understood. Thus, the purpose of this study was to use prior qualitative studies and pertinent research to develop and pilot a survey for female collegiate cross-country runners to assess their perspectives/attitudes toward health and the reasons for their eating behaviors. **METHODS:** The survey was developed primarily using themes described in Stickler, et al. (2016) with additional input from current literature on the topic. To establish content and face validity, a sports nutritionist, two triad experts, and three current or former runners reviewed the survey. Women’s cross-country coaches of schools in all Divisions (I, II, III, and NAIA) were contacted and given a link to forward on to their runners if they agreed to participate. Survey participation was voluntary. Descriptive statistics of quantitative results were performed. **RESULTS:** Minimal changes in content and wording were needed based on feedback from the expert review, and face and content validity were established. In the pilot study, the most common intrinsic factors that impacted the participants’ running and behaviors reported in the survey were self-motivation, confidence, and sleep. Several extrinsic factors played a role in daily meal decisions such as practice/race that day, cost, and time to prepare meals. **DISCUSSION:** Based on the pilot study, there are complex factors involved in the runners’ decision making regarding their health and eating behaviors. Thus, a multidisciplinary team including a sports psychologist, physician, registered dietitian nutritionist, coach, physical therapist, and athletic trainer may be indicated to develop an individualized approach to prevention and treatment of the triad and/or Relative Energy Deficiency in Sport. This approach should include education on positive energy balance, sport-specific nutritional knowledge, strategies to integrate healthy eating behaviors into routine, and management of intrinsic factors. Healthcare professionals should collaborate with coaches to consider how athletes can be encouraged to be receptive to nutrition and health education and to consider how athletes can apply what they learn to both their personal health choices and athletic performance. A question will be added to the survey to assess the athletes’ willingness to change if they receive new health and nutritional information from healthcare providers. **CONCLUSION:** The Runner’s Health Choices Questionnaire is a valid, brief, and easily accessible tool that coaches, physical therapists, physicians, athletic trainers, and other clinicians can incorporate into their practice to assess decisions behind athletes’ dietary choices and perspectives of health behaviors as applied to sport.

**PHYSICAL THERAPISTS’ KNOWLEDGE AND BELIEFS RELATED TO SPORT CONCUSSION AND ACADEMIC ACCOMMODATION: A PILOT STUDY.** Allers T, Bartlett C, Brown J, Rose JM; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Due to the high level of high school athletic participation and the high incidence of concussion in high school athletes (~300K/year), sport-related concussion has become a nationwide public health concern. Concussion can affect a student’s ability to perform on the field and in the classroom. Concussed athletes are often referred to physical therapy for management of neck pain, headache, and/or balance disturbance. Physical therapists (PTs) contribute to the return-to-play decision of these athletes, utilizing published step-wise progressions to guide physical activity advancement. Relatively little research has focused on return-to-learn (RTL) guidelines or on PTs’ knowledge or perception concerning academic accommodation (AA) recommendations. The purpose of this study was to compare PTs’ knowledge and perceptions about AAs and RTL guidelines for student-athletes post-concussion based on the highest earned physical therapy degree. **METHODS:** This was a prospective qualitative research study utilizing an online survey instrument. The “Survey for Physical Therapists Regarding Return to School in Youth Post-Concussion” is a 26-question online survey operationalized with SurveyMonkey. The survey was validated using a 2-Step Delphi Process. The items include questions related to general concussion knowledge, knowledge and perceptions related to AA, and participant demographics. An email invitation was sent to 255 PTs throughout the United States who had an affiliation with the sponsoring institution. Individuals were asked to complete the survey via SurveyMonkey and to forward the survey to other PTs. Percent correct responses were calculated for the three groups of questions. The respondents were divided into two groups depending on the highest earned physical therapy degree: Entry-Level DPT vs. Other (Bachelor, Master, or Transitional DPT). Independent samples t-tests (α = .05) were performed to determine if there was a significant difference between groups for general concussion knowledge and AA knowledge scores. The Fisher’s exact test (α = .05) was performed to determine if there was a significant difference between groups for AA perception responses. **RESULTS:** A total of 35 participants completed the survey (Entry-level DPT = 22; Other = 13). There was no significant difference between the two groups for correct responses on knowledge of concussion signs and symptoms (p = .509), knowledge of AAs (p = .475), or knowledge of RTL (p = .680). Both groups felt confident in their ability to recognize the signs and symptoms of a concussion, but they did not feel confident in recommending AAs or in implementing RTL protocols. **DISCUSSION:** It was hypothesized that entry-level DPTs may have received a stronger academic foundation for concussion assessment and treatment and would therefore perform better. Overall, both groups performed well on knowledge questions. No difference was found in knowledge of concussion signs and symptoms, AAs, and RTL protocols between PTs who received an entry-level DPT degree and those who received other degrees. Similarly, both groups reported a general lack of confidence in their ability to recommend specific AAs and to implement RTL protocols. **CONCLUSION:** PTs demonstrate knowledge related to concussion management including academic accommodation. However, they lack confidence in making academic accommodation and return-to-learn recommendations.

**SOMATIC TINNITUS AND MANUAL THERAPY: A SYSTEMATIC REVIEW.** Bays LC, Fahlen KL, Owens JS, Kinne BL; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Tinnitus is defined as the “conscious perception of an auditory sensation in the absence of a corresponding external stimulus”. Somatic tinnitus is a type of subjective tinnitus associated with disorders of the head and neck. The association between the cranial and cervical anatomy and the underlying somatosensory pathology may be modulated through manual therapy techniques in the hopes of decreasing or eradicating the tinnitus symptoms. The purpose of this systematic review was to examine the effects of manual therapy techniques on individuals with somatic tinnitus. **METHODS:** A search was performed using the following databases: CINAHL Complete, ProQuest Medical Library, and PubMed. The search terms were “somatic tinnitus” OR “somatosensory tinnitus” AND “manual therapy”. The inclusion criteria were comprised of (1) individuals, 18 years of age and older, who had somatic tinnitus; (2) manual therapy as a component of the intervention; (3) other types of therapy or no therapy as the comparison intervention if applicable; (4) valid and reliable tinnitus-specific outcome measures; and (5) studies other than those that used mechanism-based reasoning. An evaluation of the evidence level for each included article was conducted using the Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence. An evaluation of the methodological rigor for each included article was conducted using criteria adapted by Medlicott and Harris. **RESULTS:** An online database search identified 498 articles. Other sources identified two additional articles. A qualitative analysis was performed on the eight articles that met the inclusion and exclusion criteria. Three case reports and two randomized controlled trials demonstrated that manual therapy was effective for individuals with somatic tinnitus. Two non-randomized studies discovered a significantly greater tinnitus improvement in individuals with co-varying tinnitus or tinnitus sensitization. Although one randomized controlled trial found that transcutaneous electrical stimulation generally produced greater tinnitus improvement than did manual therapy, the osteopathic manipulations used in that study were still effective. **DISCUSSION:** This systematic review found that the use of manual therapy may be an effective treatment for individuals with somatic tinnitus, especially if they have co-varying tinnitus or tinnitus sensitization. The use of multiple manual therapy techniques (such as cervical mobilizations, myofascial techniques, osteopathic manipulations, soft tissue techniques, and manual therapy as developed by the School of Manual Therapy Utrecht) and/or the integration of manual therapy with other interventions (such as patient education, therapeutic exercise, transcutaneous electrical stimulation, and a home exercise program) may lead to the best outcomes. **CONCLUSION:** Manual therapy may be an effective treatment for individuals with somatic tinnitus, and a multimodal intervention approach may be the ideal way in which to positively impact an individual’s activities of daily living.

**CLINICAL REASONING PATTERNS OF PHYSICAL THERAPISTS IN THE TREATMENT OF CERVICOGENIC HEADACHE.** Faller CW, Heinicke IM, Kushba AL, Sobeck CM; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Headaches are the most common pain condition in the United States that causes a decrease in work productivity with cervicogenic headaches (CGHs) affecting 15-20% of patients diagnosed with chronic headaches. Physical therapy has been shown to be effective in treating up to 75% of patients with CGHs. However, 25% remain unresponsive to conservative treatment. This study was designed to assess the clinical reasoning of physical therapists in the selection and prioritization of CGH interventions. **METHODS:** Licensed physical therapists who primarily treat patients with musculoskeletal conditions were recruited via email to complete an online survey. They were given a hypothetical case scenario of a patient diagnosed with CGH embedded with a collection of impairments. After reviewing the case, the participants were asked to select and rank up to 10 impairments that they believed were related to the CGH symptoms. Additionally, they selected a primary intervention followed by up to three alternative interventions. Cross tabulations were analyzed to compare post-graduate education and intervention selection. Between group comparisons of impairment importance and primary intervention selection were conducted using Kruskal Wallis non-parametric tests. **RESULTS:** Low velocity mobilizations, therapeutic exercises targeting the cervical spine, postural correction/stabilization exercises, and high velocity manipulations were the most commonly selected primary interventions. When comparing post-graduate education, manually trained therapists were significantly more likely to choose manual techniques, and non-manual therapists were significantly more likely to choose non-manual techniques. A between group analysis revealed significance in 12 impairments, and the mean ranks of the primary interventions associated with those impairments were assessed. **DISCUSSION:** Among the top four selected primary interventions, only low velocity mobilizations and posture correction/stabilization exercises had significant associations to impairment findings. These results underline the importance that a C1/C2 hypomobility has with the selection of using low velocity mobilizations as well as the importance of rounded shoulders/forward head posture when selecting postural correction/stabilization exercises as an intervention. **CONCLUSION:** This study highlights the effect that post-graduate education has on the prioritization and selection of primary intervention given a hypothetical case of a patient experiencing CGH. Most physical therapists demonstrate clinical reasoning skills consistent with current evidence in prioritizing interventions for CGH. Future research is required in the consideration of more specific interventions with relationship to different presentations of CGH.

**AN INVESTIGATION OF THE CLINICAL REASONING PATTERNS OF PHYSICAL THERAPISTS IN THE SELECTION OF CERVICAL SPINE HIGH VELOCITY LOW AMPLITUDE JOINT MANIPULATION IN PATIENTS WITH NECK PAIN.** Collins K, Galuardi K, Sahr K, Sobeck C; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Physical Therapists (PTs) frequently treat individuals with neck pain because it is an increasingly common impairment throughout the lifespan, and it is highly treatable with conservative management. High Velocity Low Amplitude Thrust (HVLAT) manipulation is one technique that PTs can use to treat neck pain. However, several risks can be associated with the use of this technique making it important to understand the clinical reasoning processes PTs use in the selection of this intervention. The purpose of this study was to investigate PTs’ clinical reasoning patterns during a physical examination that would influence the selection of cervical spine HVLAT manipulation as an intervention. Additionally, the relationships between degree earned and post-professional education or training that may cause differences in clinical decision making were examined. **METHODS:** A survey instrument was constructed to examine the evaluation data that would make a clinician either more or less likely to consider using HVLAT. Only clinicians who currently perform this technique were included in the study. Data analysis consisted of percentage analysis for each test item to determine the relative importance to the participant as well as a Chi-Square test to compare PT demographic characteristics with the self-selected importance. A p-value of <0.005 was used to determine significance. **RESULTS**: The data from 259 respondents was gathered, and it was found that within the subjective portion of an examination, findings such as bilateral/radiating symptoms (77.2%) and reported weakness (74.9%) would “rarely” make the PT consider the use of HVLAT. Data that was highly considered a “red flag” to treatment included frequent fractures (89.6%) and Rheumatoid Arthritis (83.8%). The objective test most frequently used when considering this technique included cervical segmental mobility as answered by 94.2% of the respondents. There were very few statistically significant findings using the Chi-Square analysis of demographic characteristics. **DISCUSSION:** The presence of very few significant differences in responses based on PT characteristics reflects well on the uniformity in the screening process across the profession to identify high risk patients when considering the use of cervical HVLAT. PTs who opted to use HVLAT manipulation as a tool in treating patients with neck pain tended to use evaluation tests and findings as inclusion criteria, rather than as exclusion criteria, in their clinical reasoning. Small differences were found in the comparison of entry-level degree, such as reliance on imaging, that indicated possible new information being introduced to more recent cohorts who have earned their Doctorate in Physical Therapy. High-risk populations such as those who negatively react to treatment, have a history of fractures, or have been diagnosed with Rheumatoid Arthritis were successfully identified as contraindicated by most of the participants. **CONCLUSION:** PT experience and characteristics have very little influence on clinical decision making processes with performing cervical HVLAT manipulation as the decisions on indications or contraindications to utilizing this technique were highly uniform.

Poster Presentations

**THE INFLUENCE OF CONSERVATIVE INTERVENTIONS IN THE MANAGEMENT OF PIRIFORMIS SYNDROME: A SYSTEMATIC REVIEW.** Nagel J, Suminski K, Wesche K, Vaughn D; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Piriformis Syndrome’s (PS) mechanism is presumed to be compression of the sciatic nerve consequent to direct trauma, overuse/spasms of the piriformis muscle, sacroiliac pathology, or a patho-anatomic variation whereby the sciatic nerve pierces the piriformis muscle. In trying to determine the influence of conservative (non-surgical) interventions in managing these cases, a key concern is distinguishing actual cases of PS from the more common causes of sciatica. Therefore, the purpose of this systematic review was to evaluate the impact of physical therapy interventions in patients with strong clinical indicators of an actual presentation of PS. **METHODS:** A literature search was conducted acrossfour databases (PubMed, PEDro, Web of Science, and the Cumulative Index to Nursing and Allied Health Literature) in order to extract articles, from the years 1990 – 2017, pertinent to the topic. Key words, e.g., “Piriformis Syndrome”, were paired with terms, e.g., “conservative treatment” or “physical therapy”, to conduct the search. Results from the search were compiled into a spreadsheet for review by teams within the author group in order to determine eligibility for the study. Inclusion criteria were: (1) the study met the authors’ diagnostic criteria for Piriformis Syndrome, (2) the study was a case study, randomized control trial, or case series, (3) utilization of conservative therapeutic interventions in the study, (4) clinical findings were described sufficiently for data extraction, and (5) the authors reported pain and functional outcome measure scores. Exclusion criteria were: (1) the article was not in the English language, (2) the article did not identify the piriformis as the mechanism for the sciatica, (3) the condition was a complication of hip surgery or fracture, (4) the article was published outside the date range for this study, or (5) the interventions were not conservative. The authors’ diagnostic criteria for establishing PS were a positive SLR plus 2/5 of the following special tests reported to be positive: Beatty’s active abduction in SL, FAIR test, Freiberg’s passive IR of the hip in supine, Pace’s resisted ER/abduction of the hip in sitting, and/or tender external palpation of the piriformis. Due to a paucity of articles meeting these strict criteria, a second search was conducted which allowed the use of a Botox injection as a “non-conservative” intervention to complement the therapeutic measures. **RESULTS:** 1,873articles were retrieved on the first iteration: 66 met the criteria for consideration after title and abstract reviews by the author teams, and 17 were added after Botox was accepted on a second run. In total, only three articles met the Inclusion/Exclusion standards of the study: two from the initial review and one additional with the Botox inclusion factor. An evaluation of the three studies using the Grading of Recommendations Assessment, Development and Evaluation criteria resulted in a low-quality rating of the three studies with no basis for recommending a particular intervention. **DISCUSSION:** When applying rigorous diagnostic criteria for actual cases of PS, there were no meaningful studies upon which clinical decisions could be scientifically based for the application of conservative interventions (with or without the inclusion of the common practice of a Botox additive). **CONCLUSION:** With rigorous standards applied to both the establishment of a firm diagnosis of PS and the quality of the literature on the use of conservative measures in treating these patients, there were no scientific studies to support the election of one conservative intervention over another.

**MANAGEMENT OF A MALE SOCCER PLAYER WITH FEMOROACETABULAR IMPINGEMENT WITH EMPHASIS ON SPORT-SPECIFIC INTERVENTION: A CASE REPORT.** Manzer N, Stickler L; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Femoroacetabular impingement (FAI) is the morphological abnormality present in the hip joint that encompasses bony deformity of the femoral head and neck (cam), of the acetabulum (pincer), or of both areas of the hip joint (combined). While FAI is diagnosed from radiologic findings, it is important to understand that symptoms result from activity on the hip joint with increased prevalence through participation in sports. Research suggests that physical therapist management may result in successful non-operative outcomes, but there is little research regarding the efficacy of physical therapist management and intervention specific to return to sport. The purpose of this case report was two-fold: (1) to explain the examination and evaluation of bilateral hip pain with a previous diagnosis of FAI and (2) to describe the implementation of sport-specific intervention for a young male participating in high-level soccer competition with consideration of return to sport goals. **CASE DESCRIPTION:** The patient was a 17-year-old male soccer player who presented to physical therapy with referral from his sports medicine physician. The patient reported confirmed diagnosis of FAI by radiographic imaging with specific complaints of increased symptoms with sprinting, lateral movements, and striking the soccer ball. The patient presented with decreased bilateral hip range of motion (ROM), flexibility, strength, and stability contributing to limitations in his participation in soccer. The patient received nine visits of physical therapy over the course of seven weeks with the progression of interventions including mobility, strengthening, balance, and sport-specific exercises. **OUTCOMES:** The patient returned to participation in soccer training and competition with no symptoms approximately three weeks into his physical therapy management (after visit number four). Following this, the patient presented to his fifth physical therapy visit with discomfort in the right quadriceps consistent with muscle strain. At the final examination, increased ROM, strength, and flexibility were noted, but his functional goals and return to soccer were limited due to the quadriceps symptoms. **DISCUSSION:** Physical therapist management was designed to focus on the patient’s goals in returning to soccer participation, demonstrating patient-centered care that targets meaningful change to the individual. Initial intervention that focused on ROM, joint mobility, and flexibility combined with patient education was initiated for progression to higher level strengthening, core and hip stability, and sport-specific intervention to prepare the patient for the demands soccer placed his body.

**INFLUENCE OF THERAPEUTIC NEUROSCIENCE EDUCATION ON PAIN AND**

**FUNCTIONAL OUTCOME MEASURES IN PATIENTS WITH FIBROMYALGIA.**

Cammire A, Hartong S, Lutz C, Vaughn D; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Therapeutic Neuroscience Education (TNE) has been shown to be an effective treatment strategy when central sensitization is a significant factor in a patient’s clinical picture such as in the case of fibromyalgia. The authors hypothesized that TNE would be an effective treatment intervention for patients with fibromyalgia as evidenced by statistically significant improvements in pain and functional outcome measures. The results of this study may provide evidence for a more comprehensive way of treating patients with fibromyalgia. **METHODS:** A retrospective study was performed to evaluate the effects of TNE on pain and functional outcome measures for patients with fibromyalgia. The control group consisted of the first 4 patients who met the inclusion criteria, were treated at Mary Free Bed’s pain clinic between January, 2016 and December, 2016, and received traditional treatment without TNE. The experimental group consisted of the first 4 patients who met the inclusion criteria and were treated between April, 2017 and January, 2018 at Mary Free Bed’s pain clinic. This group also received the traditional treatment program, but with the addition of TNE. Both groups were treated by physical therapists who had completed Adriaan Louw’s 6-week Therapeutic Neuroscience Education Program through the International Spine and Pain Institute and by physical therapists who were extensively trained by these certified physical therapists. This training was provided during the time interlude between the above-noted data collection periods. Pre- and post-physical therapy intervention data were collected including the Fibromyalgia Impact Questionnaire (FIQ), the Pain Catastrophizing Scale (PCS), and pain levels. The data collected from the Neurophysiology of Pain Test (NPT) were only collected for the experimental group because this instrument was not in use when the control group was being treated. **RESULTS:** Due to the unexpected small sample size for the control and experimental groups, statistical analyses were not performed. With regards to FIQ scores, there was a greater average improvement in the control group pre- to post-therapeutic intervention than was demonstrated in the experimental group. However, PCS scoring demonstrated the opposite effect with the experimental group demonstrating a greater average improvement from pre- to post-intervention than the control group. Finally, average pain rating scores in the control group demonstrated a greater improvement compared to the experimental group. The NPT was only tested in the experimental group, and it showed a slight improvement from pre- to post-therapeutic intervention. **DISCUSSION:** These preliminary data do not demonstrate a definitive trend that would support, or refute, the authors’ hypothesis for this study. The authors note that the average starting FIQ scores for the experimental group were 16 points lower than the control group which possibly led to a smaller improvement in this outcome measure for the former. **CONCLUSION:** Due to the small sample sizes for the study, definitive conclusions regarding the influence of TNE cannot be drawn. Further research to gather more data is required. **ACKNOWLEDGMENTS:** We would like to show our sincere gratitude to Dan Vaughn, PT, PhD for his support throughout this process. We would also like to thank Teresa Miller, MSPT, CMDT, OCS for her passion of this topic and for her time assisting us as well as Stephanie Oakes, MSPT for her insight and for her time.

**ASSESSING THE INTRA-RATER RELIABILITY OF THE PLUG-IN GAIT AND OXFORD FOOT MODELS DURING TREADMILL RUNNING.** Broomell T, Littley J, Smith B, Alderink G; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Running is a popular form of exercise. Research to examine the three-dimensional (3D) kinematics and kinetics of running may be useful in the management of running-related injuries. The Plug-in Gait (PiG) and Oxford Foot (OFM) models have independently demonstrated face validity and reliability for the study of walking gait in adults and children. However, there is less evidence of the reliability when used to examine shod running. The purpose of this study was to examine the intra-rater reliability of the PiG and OFM models in the context of shod treadmill running with healthy adults. **METHOD**: Eleven healthy recreational runners aged 18 to 35 (6 males, mean age of 26.4 ± 5.6 years, mean BMI of 22.5 ± 1.6 kg/m2; 5 females, mean age of 26.0 ± 5.3 years, mean BMI of 24.0 ± 2.7 kg/m2) were recruited for this study. Eight were randomly selected to return for the retest session. An AMTI instrumented treadmill, 15 Vicon cameras, and Nexus motion capture software v2.7 were used to collect 3D kinematic and kinetic data. All subjects had markers placed by a single researcher with foot markers placed directly on the subjects’ skin with shoes donned. Static and walking trials were completed followed by running trials at three different speeds (3.0, 3.8, and 4.4 m/s). Data analysis for kinematic data was completed only at the 3.0 m/s speed. Data were post processed in Nexus Vicon v2.7, and three right and three left randomly selected gait cycles were exported to Visual3D for further analysis (C-Motion, Inc., Germantown, MD). Statistical analysis was completed using a variance component model. Total session variation (square root of the sum of all session-related factors) was calculated to represent intra-rater reliability between two sessions. **RESULTS:** Trunk side-bending, pelvic rotation, and pelvic obliquity were found to have the best intra-rater reliability; and hindfoot-tibia transverse plane motion, hip rotation, and forefoot-hindfoot sagittal plane motion had the worst intra-rater reliability. In general, foot kinematics demonstrated greater variability than all proximal joints/segments. **DISCUSSION:** Reliability findings for the PiG model were similar to previous studies using variance components with the exception of the knee which had better reliability. Variability in OFM markers were overall higher than PiG markers, which may be due to extrinsic factors such as poor marker placement or inadequate shoe modifications for free marker movement. Additional sources of variability in the PiG may have come from the use of the hierarchical model where errors propagate downstream, whereas error in the OFM is more likely due to individual foot differences and biomechanical alignment. This study also showed a large amount of variation attributable to limb interactions, a dimension that was overlooked in many previous studies. **CONCLUSION**: Researcher error in marker placement is an important modifiable source of extrinsic error. The multi-segment foot generally showed larger levels of extrinsic error, which may have been caused by using the OFM with shod running. Limbs should be analyzed separately in future studies due to the intrinsic variability between limbs inherent even in healthy normals. The use of a variance component model is both plausible and clinically useful for the investigation of the reliability of 3D gait data. **ACKNOWLEDGEMENTS:** Thank you to Mizuno Running for donating the running shoes used in this study.

**THE EFFECT OF FOOTWEAR ON POSTURAL SWAY IN COMMUNITY-DWELLING OLDER ADULTS.** Cekander K, Clark J, Subject L, Goehring M; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Non-slip socks are widely used in the hospital setting to decrease the risk of falls. The effectiveness of non-slip socks on the velocity of postural sway has yet to be determined by previous literature due to conflicting results. An increased velocity of postural sway has been shown to relate to an increased risk of falling. Previous studies attempting to determine fall risk in relation to footwear have reported conflicting results. The purpose of this study was to compare the velocity of postural sway of community-dwelling older adults during a simulated fall while barefoot, wearing athletic shoes, or wearing non-slip socks. **METHODS:** This study was a continuation of the pilot study, “Effects of Footwear and Postural Sway and Risks of Falls” by Bringer, Broders, and Young. This study had a repeated measures study design. Twenty-seven subjects with an average age of 58.07 years completed three trials of each footwear condition (barefoot, athletic shoes, and non-slip socks) for a total of nine trials. Subjects completed a post-study survey to subjectively rank the stability of each footwear condition. The Neurocom Balance Master was used to simulate a backward fall and collect data. Data was analyzed using a three-way ANOVA and the Generalized McNemar’s Test. **RESULTS:** In static standing, the mean velocity of postural sway for barefoot was 0.26 m/s, for athletic shoes was 0.31 m/s, and for non-slip socks was 0.26 m/s. Barefoot and non-slip socks had a p-value of P<0.05 when compared to athletic shoes. In dynamic standing, the mean velocity of postural sway for barefoot was 2.57 m/s, for athletic shoes was 2.66 m/s, and for non-slip socks was 2.38 m/s. Non-slip socks had a p-value of P<0.001 when compared to athletic shoes. In combination (static and dynamic), the mean velocity of postural sway for barefoot was 1.41 m/s, for athletic shoes was 1.49 m/s, and for non-slip socks was 1.32 m/s. The p-value between footwear conditions for the combined data was P>0.05. The post-study survey analysis revealed a p-value of 1.000. **DISCUSSION:** This study found a significant difference in velocity of postural sway during static standing between barefoot, athletic shoes, and non-slip socks. During dynamic standing, a significant difference was found with non-slip socks. When the data was combined, there was no significant difference between any of the footwear conditions. The p-value of 1.000 for the post-study survey concluded that the subjective rank of the most stable footwear condition did not match the objective data from the Neurocom. **CONCLUSION:** Non-slip socks may be effective at reducing the velocity of postural sway in community-dwelling older adults and thus may be effective at reducing fall risk. Non-slip socks may be the safest footwear for functional mobility in the hospital setting.

**EFFECTIVENESS OF VISUAL SCANNING TRAINING AT REDUCING THE EFFECTS OF LEFT NEGLECT: A SYSTEMATIC REVIEW.** Bennison A, Rohde K, Timmer L, Baker B, Kinne B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Neglect is a neurological disorder characterized by a failure to perceive or attend to stimuli presented on one side of the body. It is caused by a lesion of the parietal lobe, most often as a result of a cerebrovascular accident (CVA) or traumatic brain injury. Visual scanning training (VST) was first developed in the 1970s as a rehabilitation method to overcome complications due to neglect. The purpose of this systematic review was to evaluate the effectiveness of VST as compared to other treatments or no treatment at reducing the effects of left neglect caused by a right-sided CVA. **METHODS:** CINAHL Complete, ProQuest Medical Library, and PubMed were the databases used to search the terms “visual scanning” AND “neglect” AND “randomized”. The following inclusion criteria were used for this systematic review: (1) adults, 18 years of age and older, diagnosed with left neglect due to a CVA; (2) an intervention group that received VST; (3) a comparison group that received other interventions or no intervention; (4) reliable and valid outcome measures that evaluated changes in neglect; and (5) randomized controlled trials. The Oxford Center for Evidence-Based Medicine 2011 Levels of Evidence was used to establish the evidence level of each included study, and the PEDro scale was used to establish the methodological rigor of each included study. **RESULTS:** Three electronic databases revealed 1069 articles, and two additional articles were discovered through alternate sources. Eight articles, eligible based on the inclusion and exclusion criteria, were used in this systematic review. Three of the eight studies found that VST was better than mental practice training, no treatment, or conventional therapy alone. In the other five studies, VST was found to be generally less effective at reducing left neglect when compared to other interventions such as a right half-field patch, smooth pursuit training, optokinetic stimulation training, and arm activation training. However, participants who received VST still demonstrated statistically significant improvements. **DISCUSSION:** This systematic review revealed that VST is an effective intervention for reducing the effects of left neglect. Important elements in VST intervention may include the provision of verbal and tactile cueing, the incorporation of common functional tasks, and the utilization of left-sided anchoring and compensatory strategies. In addition, the effectiveness of VST appears to be enhanced when it is used in combination with conventional therapy or other interventions. **CONCLUSION:** Therapists should consider using VST, alone or in combination with other forms of therapy, when treating individuals with left neglect.

**THREE DIMENSIONAL ANALYSIS OF DYNAMIC BALANCE DURING OBSTACLE CROSSING AND WALKING AT SELF SELECTED SPEED IN INDIVIDUALS WITH PARKINSON’S DISEASE.** Avery M, Daman C, Laker D, Alderink G; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Individuals with Parkinson’s disease (PD) demonstrate signs, such as weakness and impaired motor control, which may be related to an increased risk of falls. Sensitive biomechanical variables that detect absence of dynamic balance are needed. The purpose of this study was to determine if differences in dynamic control during self-paced walking and stepping over an obstacle were present between persons with and without PD. **METHODS:** The participants included 9 individuals with mild to moderate PD (all male, mean age 65.5 ± 9.6 years, mean weight 92.9 ± 15.4 kg, mean height 181.8 ± 8.3 cm) and 9 age- and gender-matched controls (mean age 65.6 ± 7.2 years, mean weight 83.6 ± 12.6 kg, mean height 182.7 ± 9.6 cm). Following a consent process, the participants were screened for medical and fall history, walking and balance (Berg) ability, and cognition (Montreal Cognitive Assessment). Marker trajectories, according to a modified Plug-in Gait model, were captured (120 Hz) using a Vicon motion capture system (Nexus v2.6.1). Ground reaction forces were collected (1200 Hz) with AMTI force plates while the participants walked over a level surface and stepped over an obstacle. Three successful right and left gait cycles were exported and analyzed using Visual3D biomechanical software. SAS JMP 13 software was used for primary and spatiotemporal (ST) variables. The analysis involved examining variables from loading response (LR) to mid-stance (MS) of the gait cycle. MANOVA was used for the primary variables (COM\_COP M/L angle, XCOM\_COP M/L distance, and XCOM\_UMax M/L distance). The secondary variables were analyzed with post hoc two sample t-tests (α =0.05). **RESULTS:** The PD group demonstrated increased double limb stance (p=0.0009) and decreased swing time (p=0.0019) during walking compared to controls. During obstacle crossing, all spatiotemporal variables were statistically different between the groups except for cadence and swing time. COM\_COP M/L angle between task and condition was statistically significant (p = 0.0093). No statistical significance was observed between task and condition for XCOM\_COP M/L distance (p = 0.1445) or XCOM\_UMax M/L distance (p = 0.1189). **DISCUSSION:** A significant increase in COM\_COP M/L angle among PD subjects compared to the control subjects was observed, echoing previous research that individuals with PD may widen their base of support to increase stability. A trend of increasing XCOM\_COP M/L distance as subjects transitioned from LR to MS was seen among both conditions, indicating that MS is an unstable point in the gait cycle. The mean XCOM\_UMax M/L distance was generally greater in the PD group compared to the controls, demonstrating an increased margin of stability, a common compensatory pattern. The findings may be limited by the PD group that was only mildly to moderately involved. **CONCLUSION:** COM\_COP M/L angle was greater in the PD group, and PD ST variables during obstacle crossing suggested a more conservative gait suggesting that the PD group showed mild compensations.

**COMPREHENSIVE PHYSICAL THERAPY MANAGEMENT OF CHEMOTHERAPY-INDUCED PERIPHERAL NEUROPATHY: A CASE REPORT.** Sanders M, Green M; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** As survival rates increase among individuals diagnosed with cancer, secondary issues arise post-treatment such as cancer-related fatigue, lymphedema, genitourinary dysfunction, pain, and peripheral neuropathies, mainly chemotherapy-induced peripheral neuropathy (CIPN). CIPN typically presents with primarily sensory-related deficits including numbness, tingling, and pain. Studies have shown that the negative consequences of CIPN can be quite significant and can result in a marked decrease in quality of life, functional abilities, and ambulation as well as an increase in fall risk. The purpose of this case report was to describe the comprehensive physical therapy management of a patient diagnosed with CIPN following bilateral mastectomy with left axillary lymph node resection and chemotherapy with taxane agents completed six months prior to physical therapy evaluation. **CASE DESCRIPTION:** The patient was a 52-year-old Caucasian female who was referred to physical therapy for the management of CIPN-associated pain, balance problems, and functional deficits. The patient reported numbness, tingling, and pain in her bilateral feet, rating the pain at a 4/10 at rest and 7/10 with increased activity. The patient reported occasional dizziness when fatigued and a decline in balance during ADL-related tasks and positional changes, especially notable in low light situations. Sensory organization testing (SOT) on the NeuroCom® system revealed deficits in conditions #5 and #6 with a composite score of 68, 3% below age norms. The patient reported difficulties with stairs and floor transfers, and she relied on her upper extremities for balance with sit to stand transfers. She was unable to complete her custodial job due to her deficits. Interventions included a trial of TENS, a referral for Calmare® pain therapy or “Scrambler Therapy”, manual lymph drainage and compression garments for lymphedema management, and dynamic balance activities including the use of unstable surfaces, narrow base of support conditions, eyes open/eyes closed conditions, and the incorporation of head turns with functional activities. **OUTCOMES:** The patient requested to be discharged on her 9th physical therapy session stating that she felt she had made significant progress with her balance, the restoration of her functional abilities, and the reduction of her bilateral foot pain which she rated 3-4/10 with activity. Patient reported being pain free for 24 to 36 hours after the “Scrambler Therapy”. Furthermore, the patient cited no dizziness or perception of instability in low light settings or during positional changes. The patient also demonstrated improvements in the NeuroCom Balance Master® SOT testing with a composite score of 76 and an improvement from 37 to 71 on the vestibular component. She was also able to return to work. **DISCUSSION:** This patient progressed well throughout physical therapy and presented with findings that warrant further research. Specifically, this report agrees with a study by Wampler et al. reporting that postural instability in breast cancer survivors was likely due to the patients’ inability to appropriately use their vestibular input. Although no studies report vestibular toxicity following taxane use, there has been research suggesting a vestibular component to those patients post-chemotherapy treatment who presented with postural instability. Finally, the few studies published regarding the efficacy of “Scrambler Therapy” in patients with CIPN have shown promising results. The patient in this case report benefitted from the use of this pain modality.