

**DPT Research Day**

**Class of 2021**

Abstracts for

Platform Presentations

**Thursday, July 15, 2021**

**4:00– 8:00 PM**

**Virtual Format**

**Department of Physical Therapy**

**Grand Valley State University**

Platform Presentation

Track A

**ROLL MANEUVERS VERSUS SIDE-LYING MANEUVERS FOR GEOTROPIC HORIZONTAL CANAL BPPV: A SYSTEMATIC REVIEW.** Harless MG, Lauzon KA, Wamhoff JR, Kinne BL; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Benign paroxysmal positional vertigo (BPPV) is a common vestibular disorder characterized by a sensation of spinning vertigo. Although posterior canal BPPV (PC-BPPV) is the most common type of BPPV, researchers have found that up to 31.9% of the total cases of BPPV are due to the horizontal variant of the disorder. In addition, quality of life is more negatively affected in individuals with horizontal canal BPPV (HC-BPPV) than in those with PC-BPPV. Therefore, the purpose of this systematic review was to determine the most effective roll maneuvers and side-lying maneuvers while treating individuals with geotropic HC-BPPV. **METHODS:** CINAHL Complete, PubMed, and Web of Science were the databases accessed throughout the search process. The search terms were geotropic AND (horizontal OR lateral) AND vertigo. The inclusion criteria utilized in this systematic review included (1) individuals diagnosed with geotropic HC-BPPV not related to light cupula; (2) replicable maneuver interventions for geotropic HC-BPPV that are performed by a healthcare professional in the clinic and that do not require specialized equipment to perform; (3) complete alleviation of nystagmus and/or vertigo as the outcome measure; and (4) studies with level 2 or level 3 evidence. The evidence level of the included studies was evaluated using the Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence. The methodological rigor of the included studies was evaluated using a 10-item tool created by Medlicott and Harris. **RESULTS**: Four hundred thirty-two articles were identified in a search of three online databases, and five additional articles were identified using supplemental sources. Based upon the inclusion and exclusion criteria, 19 articles were qualitatively analyzed. The one-treatment session efficacy ranged from 38.5% to 91.7%for the Baloh 360-degree roll maneuver, from 66.7% to 93.1% for the Lempert 270-degree roll maneuver, and from 60.9% to 100.0% for the Gufoni maneuver. The one-treatment efficacy of four novel treatment maneuvers ranged from 61.7% using the Li quick repositioning maneuver to 93.5% using the Ichijo 120-degree roll maneuver. **DISCUSSION**: All of the maneuvers included in this systematic review demonstrated high efficacy and few contraindications. The symptoms of HC-BPPV tend to resolve more quickly without treatment when compared to those of PC-BPPV. However, the maneuvers described in this systematic review may accelerate the resolution process in individuals with long-term HC-BPPV symptoms. **CONCLUSIONS:** It is recommended that clinicians utilize one of the maneuvers identified in this systematic review for individuals with geotropic HC-BPPV. The Gufoni maneuver might be preferable to the Baloh 360-degree roll maneuver and/or the Lempert 270-degree roll maneuver when treating individuals who are elderly, are obese, and/or experience immobility. If an individual is unable to tolerate a maneuver or prefers not to have one performed, forced prolonged positioning is another possible option.

**SUB-ACUTE HOME PHYSICAL THERAPY MANAGEMENT OF AN INDIVIDUAL POST-CORONARY ARTERY BYPASS GRAFT UTILIZING HIGH-INTENSITY INTERVAL TRAINING PRIOR TO OUTPATIENT CARDIAC REHABILITATION: A CASE REPORT.** Fort J, Green M; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Heart disease is the leading cause of death in the United States and is most commonly accompanied by coronary artery disease (CAD) in Americans >20 years of age. CAD, in its most serious manifestation, results in a myocardial infarction (MI). This complication presents itself as either an ST-segment elevation MI (STEMI) or as a non-ST-segment elevation MI (NSTEMI) depending on the extent of the artery occlusion. A common procedure for the treatment of an MI is a coronary artery bypass graft (CABG) surgery. Following cardiac surgery, individuals are often referred to a cardiac rehabilitation program to reduce the risk for a future cardiac event. One training model that has gained recent popularity within cardiac rehabilitation programs has been observed to produce notable cardiovascular benefits. This intervention is called high-intensity interval training (HIIT), and it utilizes alternating periods of intensive aerobic exercise with periods of minimal, active or passive recovery. The purpose of this case report was to document the implementation and outcomes of HIIT intervention within sub-acute home physical therapy (PT) management of an individual post-NSTEMI and CABG prior to beginning outpatient cardiac rehabilitation. **CASE DESCRIPTION:** The patient was a 59-year-old Caucasian male recently discharged from the hospital following cardiac surgery. Prior to beginning an outpatient cardiac rehabilitation program, he was referred for multidisciplinary home healthcare services to provide a smooth transition back home and to ease into more intense outpatient rehabilitation. Four days after his discharge from the hospital, home PT was initiated. The patient was performing bed (recliner) mobility and transfers with moderate physical assist. He was unable to negotiate a full flight of stairs to access his second-floor bedroom. His score on the 30-second chair stand test (30CST) was 12 repetitions, and he ambulated 975 feet on the six-minute walk test (6MWT). His goals were to be able to access his upstairs bedroom to sleep in his bed and to begin cardiac rehabilitation by the end of the month. The initial HIIT program consisted of 30-second intervals of alternating high-intensity exercise (step-ups) and low-intensity exercise (heel raises) for a total of 4 minutes. Prior to and following the intervals, 2 minutes of continuous walking was completed as a warm-up and cool-down. Throughout the course of his care, the intervention was gradually progressed up to a total of 5 minutes of interval training with a 4-minute warm-up and cool-down period at the time of his discharge from home PT. Vital signs and his rate of perceived exertion (RPE) were monitored pre- and post- exercise session. **OUTCOMES:** A total of four home PT visits were completed over 21 days. The patient was able to ascend and descend 13 stairs independently to access his upstairs bedroom. Functional mobility improved with his ability to perform bed mobility and transfers independently. His 30CST score improved from 12 repetitions to 13 repetitions, and his score on the 6MWT improved from 975 feet to 1,125 feet. The patient began outpatient cardiac rehabilitation the following week. **DISCUSSION:** The patient successfully completed a HIIT regimen without any adverse events. This case is an example of the effective implementation of a HIIT program in the home setting prior to outpatient cardiac rehabilitation for an individual post-CABG secondary to an NSTEMI. The outcomes of this case agree with previous literature demonstrating that, with thoughtful patient selection, HIIT is a safe, feasible, and efficient mode of training for cardiorespiratory fitness and functional capacity.

**EFFECT OF THE COVID-19 PANDEMIC RESTRICTIONS ON PHYSICAL ACTIVITY, MOTOR SYMPTOMS, AND NON-MOTOR SYMPTOMS IN PERSONS WITH PARKINSON’S DISEASE**: **A SCOPING REVIEW.** Bartley R, Kayfish E, Malear E, Noakes A, Sugg B, Tanis L, Harro CC, Shoemaker M; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The SARS-CoV-2 (COVID-19) pandemic resulted in restrictions that may have led to significant changes in the physical activity and medical care for persons with Parkinson’s Disease (PwPD) around the globe. This scoping review aimed to evaluate the current state of the literature regarding the impact of COVID-19 pandemic restrictions on physical activity, motor symptoms, and non-motor symptoms in PwPD. **METHODS:** In this scoping review of the literature, the following databases were searched between February 11-18, 2021: Medline, Ovid, Proquest, RehabData, Science Direct, SpringerLink, Wiley Online Library, PubMed, CINAHL, PEDro, and APTA Database. Studies were included if they focused on PwPD, were conducted during the COVID-19 pandemic, and examined the effects of the pandemic on physical activity, motor symptoms, and/or non-motor symptoms. Case reports and clinical commentary were excluded. **RESULTS:** The online database search identified 96 articles. Twenty-two articles met the inclusion and exclusion criteria and were qualitatively reviewed. The majority of these studies were survey-based research (77%) with a smaller number of quantitative studies using standardized measures. The research reviewed represented data collected in 16 different countries. Adverse effects of the COVID-19 pandemic restrictions on physical activity were noted in five out of six studies with 42-47% of PwPD reporting decreased physical activity. Nine studies consistently found a worsening of motor symptoms during the pandemic restrictions with 11-80% of PwPD reporting an increase in bradykinesia, rigidity, tremor, gait, or postural instability. Across studies, 16-53% of PwPD reported a new onset or worsening of various non-motor symptoms during the pandemic (anxiety, depression, stress, and/or sleep disturbances). **DISCUSSION:** This scoping review of the literature revealed that the initial restrictions associated with the COVID-19 pandemic across the globe had adverse effects on physical activity, motor symptoms, and non-motor symptoms in PwPD. A majority of the studies consistently reported a significant worsening of anxiety, depression, and stress in PwPD during the pandemic restrictions. Included studies only examined the early months of the pandemic when restrictions were generally the greatest, and the duration and severity of the restrictions varied across countries. No studies examined the long-term effects of the pandemic and associated restrictions over the course of the past year in PwPD. **CONCLUSIONS:** The research demonstrates that PwPD have experienced a significant decrease in physical activity and new or worsening motor and non-motor symptoms since the onset of the COVID-19 pandemic. Given these adverse effects, a multimodal, holistic, interdisciplinary team approach to detect and address these issues will be vital to help prevent further decline and to optimize the health and disease management in this population.

**FATIGUE AND MS: HOW FATIGUE IMPACTS DAILY PARTICIPATION AND QUALITY OF LIFE: A QUALITATIVE STUDY.** Maynard E, McDonald R, Reece S, Baker B, Kenyon LK; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION**: Multiple Sclerosis (MS) is the most common neurological disease among young adults with as many as 2.3 million people being affected worldwide. Fatigue, one of the most commonly reported symptoms associated with MS, affects nearly 70% of individuals with MS. Despite the high prevalence and significant impact of fatigue, the complexity and subjective nature of fatigue may result in a lack of understanding its true influence on people with MS. Therefore, the purpose of this study was to gain an understanding about how fatigue in individuals diagnosed with MS may have influenced their activities and participation in everyday life. **METHODS**: Focus groups, conducted in-person or via Zoom, were used to gather data in this qualitative study. Nineteen participants with MS were included with 53% of the participants diagnosed with relapsing remitting MS, 37% diagnosed with secondary progressive MS, and 10% diagnosed with primary progressive MS. An initial focus group was conducted in-person, while subsequent focus groups were conducted via Zoom due to Covid-19 restrictions. All focus groups were audio-recorded and transcribed verbatim. A constant comparative method, wherein units of information within the data were independently assigned a draft code by three researchers, was used to analyze the data. Coding discrepancies were then discussed, and an initial codebook was developed and then used to individually code all of the data. A final codebook was developed through discussion and consensus among the three researchers. The codes were then collapsed into themes. **RESULTS**: Four themes emerged from the data and were ordered based upon the strength of the data. The themes were as follows: (1) “Changes in Social Roles and Functions and their Influence on Participation”; (2) “Planning, Adjustments, Making Things Work, a New Normal”; (3) “Well You Don’t Look Like You Have MS”; and (4) “Sledgehammer to an Egg”. **DISCUSSION:** The theme related to changes in social roles and functions, and their resulting influence on participation, is well-supported in the literature. Shifting family dynamics may occur following an MS diagnosis due to these changing social roles and the need for individuals to adapt to the symptoms of MS. Participants described having to learn to how to cope with (1) the perceived social stigma surrounding MS, (2) others not understanding the impacts of the symptoms on everyday life, and (3) the variety of emotions that accompany the disease. **CONCLUSIONS:** Those with MS face many life challenges due to various symptoms of the disease following diagnosis. The healthcare team working with those with MS should consider all aspects of the disease to facilitate individually relevant, positive, meaningful outcomes.

**THE EFFECT OF TAI CHI EASY ON GAIT-RELATED PARAMETERS, QUALITY OF LIFE, AND FATIGUE IN PEOPLE WITH MULTIPLE SCLEROSIS.** Dietz M, Romph E, Van Dyke H, Lee Y, Sander TC; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Exercise results in a number of well-known benefits for individuals with Multiple Sclerosis (MS) including aerobic fitness, fatigue, perceived health, activity level, and cardiopulmonary improvements. A variety of activities have been evaluated for people with MS to determine effective exercise plans for this population including high intensity interval training and yoga. However, research on the effects of Tai Chi Easy (TCE) for individuals with MS is limited. **METHODS:** Six individuals with MS were randomly assigned to the TCE intervention group or to the home stretching control group. Two subjects in the TCE group (48.5 ± 4.9 years; 170 ± 7.1 cm; 100 ± 40.1 kg; EDSS = 3.5 ± 0) participated in three 60-minute virtual exercise classes per week for 6 weeks. TCE was conducted in a seated position under the supervision of a certified TCE instructor and at least one student physical therapist. Four participants in the control group (55.7 ± 7.9 years; 169 ± 4.6 cm; 88.5 ± 19.6 kg; EDSS = 3.63 ± 0.6) completed a home stretching program three times per week for 6 weeks. Both groups underwent a pre- and post-evaluative process that included five different outcome measures examining gait-related parameters, fatigue, and quality of life: the Multiple Sclerosis Quality of Life (MSQOL), the Multiple Sclerosis Questionnaire for Physiotherapists (MSQPT), the Functional Assessment of Multiple Sclerosis (FAMS), the 12-Item Multiple Sclerosis Walking Scale (MSWS-12), and the Modified Fatigue Impact Scale (MFIS). **RESULTS:** Both the TCE and control groups demonstrated improvements in gait-related parameters as evidenced by a decrease in the MSWS-12 from 35 to 31 and 21 to 19, respectively. The TCE group demonstrated improvements in functional abilities on the MSQPT (1720 to 1795) and on the FAMS (88 to 102). Although the control group demonstrated improved functional abilities on the MSQPT (1860 to 1903), this group showed a decline in functional abilities on the FAMS (120 to 114). The TCE group also demonstrated improvements in both physical (41 to 44) and mental (49 to 62) health on the MSQOL, whereas the control group showed improvements in mental health (63 to 67) but a decrease in physical health (69 to 62). **DISCUSSION:** Those in the TCE group showed greater improvements in every outcome measure as compared to those who were in the control group. Although there was not a large enough sample size from which to draw conclusions, TCE shows promise as an excellent therapeutic activity for people with MS. **CONCLUSIONS:** TCE was a feasible intervention in the virtual environment for patients with MS to perform in a seated position. The benefits of using a virtual platform such as Zoom increased patient motivation and the ease of access to the intervention. Additional studies with a large sample size and a random block-design are needed to confirm the benefit of TCE for individuals with MS.

**DYNAMIC MEASURES OF BALANCE WITH A NINETY-DEGREE TURN DURING SELF-SELECTED GAIT IN INDIVIDUALS WITH MILD PARKINSON’S DISEASE.**

Bourke M, Gosla A, Rustmann S, Alderink G; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Falls are a common issue in the aging population, but they are even more of an issue in the aging population with Parkinson’s disease (PD) as these individuals have an increased risk of falls. There is a lack of literature that examines margin of stability (MOS) in this population during gait and turns. Therefore, the purpose of this exploratory study was to examine the difference in dynamic balance control in individuals with mild to moderate PD and healthy individuals during walking, while performing 90 degree turns, utilizing computerized three-dimensional (3D) gait analysis. **METHODS:** This was a prospective quasi-experimental study. Eleven individuals with mild to moderate idiopathic PD and ten healthy controls (CON) from Grand Rapids, MI participated in the study. Potential participants who passed the initial phone screening were included in the data collection during “on” medication times. The Freezing of Gait Questionnaire (FOGQ), Montreal Cognitive Assessment (MoCA), and Berg Balance Scale (BBS) were completed; and demographic information, history of PD and falls, and current medications were obtained. The physical examination included posture and balance, range of motion, strength, and anthropometric measures; and this examination was followed by the placement of retroreflective markers for a modified Plug-in Gait model. A computerized 3D gait analysis with Vicon cameras and AMTI force platforms was used. Vicon Nexus was used to collect, reduce, and determine kinematic/kinetic data; and Visual 3D software was used to create a model and determine kinematics/kinetic data. Turning trials were performed until three valid right and left turns were obtained for each participant.A two-factor mixed-model ANOVA was used to analyze the primary and secondary dependent variables. The primary dependent variables included center of mass (COM) to center of pressure (COP) inclination angle, the distance between the COM to COP, extrapolated COM to COP, and base of support (UMAX) to XCOM in the anterior/posterior (A/P) and medial/lateral (M/L) directions. The secondary dependent variables, spatiotemporal parameters (ST), included velocity, stride width, stride length, step length, cadence, stance time, and swing time. Bonferonni adjusted significance levels of 0.005 for ST parameters and 0.002 for dynamic balance variables were used. **RESULTS:** No significant differences of ST parameters and dynamic balance variables were observed between the PD and CON groups. Gait velocity (p=0.011), COM - COP inclination angle at midstance (MS) (p = 0.006), COP - COM A/P at MS (p = 0.020), UMAX - XCOM A/P at MS (p = 0.024), and FDS (p = 0.046) demonstrated trends toward meaningful differences. **DISCUSSION:** The results of the study showed mild, if any, difference in dynamic balance variables, specifically MOS. This lack of difference between the groups may be related to the lack of changes at this point in disease progression in the PD group. Further research in the more advanced stages of disease progression may yield more changes in MOS and dynamic balance variables. **CONCLUSIONS:** Changes in gait and strategies for the maintenance of balance during gait, especially during turns, may occur in individuals with PD. At this time, there were insignificant results to show a statistically significant difference in dynamic balance variables, including MOS, when comparing healthy elderly individuals and individuals with PD. **ACKNOWLEDGEMENTS:** Faculty Collaborators: Cathy Harro, PT, DPT, MS, NCS; David Zeitler, PhD.

**INTERVENTIONS TO DECREASE PERSISTENT TOE-WALKING IN CHILDREN WITH AUTISM: A SYSTEMATIC REVIEW.** Brown KB, Emerick EM, Maurer AJ, Chesser BT, Kinne BL; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Autism Spectrum Disorder **(**ASD) is a condition that is categorized by varied neurodevelopmental, social, cognitive, and behavioral abnormalities. A higher incidence of toe-walking occurs in individuals with a family history of or a diagnosis of ASD, cerebral palsy, muscular dystrophy, or other neurological condition. Although some children spontaneously cease toe-walking, children with neurodevelopmental delays are likely to continue to toe-walk if no intervention is provided.The purpose of this systematic review was to evaluate the effectiveness of physical therapy interventions for decreasing toe-walking in children diagnosed with ASD. **METHODS:** The following online databases were utilized during the search process: ProQuest Medical Database, PubMed, and Wiley Online Library. The search terms utilized were autism AND “toe walking” AND (child OR children) AND (intervention OR rehabilitation OR therapy OR treatment). The inclusion criteria were (1) individuals, aged 21 years or younger, who have a diagnosis of ASD; (2) therapeutic interventions specific to toe-walking; (3) treatments other than physical therapy as the comparative intervention in randomized controlled trials; (4) assessment of gait as the outcome measure; and (5) studies with evidence levels of 2, 3, or 4. The evidence level of all articles included in this systematic review was evaluated using the Oxford Centre for Evidence-Based Medicine 2011 Levels of Evidence table. The methodological rigor of all articles included in this systematic review was evaluated using a 10-item tool established by Medlicott and Harris. **RESULTS:** Three online databases revealed 296 potential articles, and two additional records were identified through other sources. Upon examination of the inclusion and exclusion criteria, a total of six articleswere then qualitatively analyzed. Serial casting was utilized in one of the six studies, and this medical intervention resulted in increased bilateral ankle dorsiflexion and improved gait kinematics as measured by observational gait analysis as well as improved scores on the Functional Mobility Scale and the Observational Gait Scale. Behavioral interventions such as simplified habit reversal, differential reinforcement of incompatible behavior using a stimulus prompt, a multiple schedule, and discriminative stimulus control were utilized in the other five studies. Within these five studies, persistent toe-walking occurred 57% to 100% of the time during pre-treatment. During post-treatment, persistent toe-walking occurred 0% to 34% of the time. **DISCUSSION:** This systematic review found that a medical intervention (serial casting) was an effective treatment for decreasing persistent toe-walking in a child with limited ankle dorsiflexion bilaterally. Behavioral interventions (such as simplified habit reversal, differential reinforcement of incompatible behavior using a stimulus prompt, a multiple schedule, and discriminative stimulus control) were also found to be effective treatments for decreasing persistent toe-walking. **CONCLUSIONS:** It is recommended that clinicians consider utilizing appropriate medical and behavioral interventions when treating children with ASD and persistent toe-walking.

**USE OF NARRATIVE ANALYSIS IN CHILDREN WITH MULTIPLE SEVERE DISABILITIES: A PROTOCOL AND REPORT OF TWO CASES.** Bartlett S, Lynch K, Wolters M, Kenyon L, Aldrich, N; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** A strong therapeutic alliance between a physical therapist (PT) and patient/family is crucial for favorable patient outcomes, and communication is a key component of this alliance. The exploration of social cognition (i.e., neurocognitive processes involved in social interactions) in children with multiple, severe disabilities (MSD) may allow PTs to better understand the child as a whole, and this may facilitate improved interactions with children/families. The purpose of this pilot study was to explore parental perceptions of the socio-cognitive abilities of children who have MSD. **METHODS:** A qualitative pilot study was conducted with two mother-child dyads involving twelve-year-old twins diagnosed with cerebral palsy (CP) who functioned at Gross Motor Function Classification System (GMFCS) Level III CP and GMFCS Level V CP. The mother completed the Child Social Understanding Scale (CSUS) to assess her children’s theory-of-mind skills, Parenting Stress Index (PSI-4-SF) to assess her parenting stress, Behavior Rating Inventory of Executive Function (BRIEF-2) to assess her children’s executive function abilities, and Adaptive Behavior Assessment System (ABAS-3) for herself and the twins to assess adaptive and communication skills. The mother also completed an audio-recorded narrative task that involved telling each child a story based on a wordless picture book *Frog, Where are You?* (Mayer, 1980). The story was transcribed in minCHAT format then coded and analyzed using Computerized Language Analysis (CLAN) to examine the mother’s lexical diversity (i.e., richness) and perspective-taking. Linguistic Inquiry and Word Count (LIWC) analysis was also used to examine the mother’s language complexity and cognitive processes during storytelling. **RESULTS:** On the CSUS, the twin with GMFCS Level III CP displayed more advanced theory-of-mind abilities compared to his twin. The PSI-4-SF conveyed that the caregiver had higher levels of stress with the twin with GMFCS Level V CP. The BRIEF-2 indicated that the mother perceived that the twin with GMFCS Level III CP was successful with behavioral regulation and that both twins had skills in cognitive regulation. The ABAS-3 indicated that the twin with GMFCS Level III CP was quite communicative while his twin was not. CLAN analysis revealed that the caregiver’s story emphasized emotions with the twin with GMFCS Level III CP and emphasized intellectual states and action descriptors with his twin. The story was also “richer” with the twin with GMFCS Level V CP. LIWC analysis indicated the mother used more complex language with the twin with GMFCS Level III CP and spoke with more confidence with his twin. **DISCUSSION:** Our results indicate that the mother had notable stress with parenting both children. The BRIEF-2 emphasized that the mother perceived the child with GMFCS Level III’s strength in regulating thoughts and actions and highlighted the child with GMFCS Level V’s understanding of her surroundings. This, along with the results of CLAN and LIWC analyses, indicated that the mother’s communication with each twin corresponded to the twin’s socio-cognitive abilities as she modified her language diversity and complexity to match her perceived levels of each twin’s socio-cognitive skills. **CONCLUSIONS:** The aforementioned protocol appears to be a promising tool to assess the social cognition of two children with MSD. The mother likely recognized the twin’s socio-cognitive abilities and modified her language use accordingly. PTs may be able to adopt the linguistic tendencies of a caregiver when addressing the patient to effectively promote the therapeutic alliance. **ACKNOWLEDGMENTS:** This research was supported by a grant from the GVSU Center for Scholarly and Creative Excellence.

**FINDING FREEDOM: A QUALITATIVE STUDY ON THE PERSPECTIVES OF**

**CHILDREN AND PARENTS ON POWER MOBILITY INTERVENTIONS.** Satkiewicz RM, Tran LB, Wickenheiser AG, Kenyon LK; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Two essential components of childhood development are having the ability to explore and to gain independence. The use of power mobility devices allows children with mobility limitations to interact with and learn from their environment while simultaneously providing a means of functional mobility and independence. To date, there is little evidence on the provision of power mobility interventions for children. Therefore, the purpose of this study was to explore pediatric power mobility interventions and outcomes from the perspectives of children who use a power wheelchair (PWC) and the parents/caregivers whose children use a PWC. **METHODS:** This qualitative research study consisted of two stakeholder groups: (1) children ages 6 to18 years who used a PWC and (2) parents whose children (≤ 18 years of age) used a PWC. The sample included a total of 28 participants (15 parents and 13 children). Data were gathered through face-to-face interviews or via Zoom®. Data were analyzed using the constant comparative method where each author independently identified units of information within the data and assigned a draft code. The draft codes were then discussed among the authors to create an initial coding guide. Data were then individually reviewed and coded by each author. Discrepancies were resolved through discussion until consensus was reached, and a final codebook was then created. Finally, codes were collapsed into themes. Dedoose® was used to organize, store, and visualize data. **RESULTS:** Three main themes emerged in the data: (1) ‘Freedom to Learn’ described how interventions must be child-led, meaningful, purposeful, encouraging, and individualized; (2) ‘Mobility is Freedom’ showed how power mobility use allowed children the freedom to move and choose where to go; and (3) ‘Freedom to Discover’ depicted how power mobility use provides opportunities for socio-emotional growth and development. **DISCUSSION**: The themes that emerged from this study aligned with previous studies highlighting the importance of self-directed learning, independence, environment influences, and developmental benefits within power mobility interventions. **CONCLUSIONS:** This study highlighted the need for child-led power mobility interventions while continuing to consider a child’s progression within the process of learning how to use a power mobility device. Power mobility device use is complex and unique to each child. In conjunction with interventions, various freedoms surfaced and were associated with the development of a child’s independence in using a power mobility device.

**EXPLORING ICF CODING TO IDENTIFY FACTORS USED IN PLANNING AND**

**PROVIDING PEDIATRIC WHEELCHAIR SKILLS TRAINING.** Benoit C, Lyon L, Sterk C, Kenyon LK; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION**: With the number of children using manual and power wheelchairs steadily rising, there is an increased need to understand the factors clinicians consider when providing wheelchair skills training. The purpose of this pilot project was to create a coding schema that could be used to identify the various factors clinicians consider when planning and providing pediatric wheelchair skills training. **METHODS**: Participants’ thoughts and considerations were obtained using a modified think-aloud study design. The six participants from the United States (four physical therapists, one occupational therapist, and one researcher) participated in the pilot study. Participants’ pediatric wheelchair skills training experience varied from 6 months to 39 years. Audio-recorded, one-on-one interviews were conducted via Zoom. During the interviews, participants watched videos of children performing various wheelchair skills using either a manual wheelchair (MWC) or a power wheelchair (PWC) (e.g., propelling a MWC forward, performing a transient tip in a MWC, driving up a ramp in a PWC, and opening a door while driving a PWC). Before viewing each video, participants were asked to think aloud about what was involved in performing the skill to be depicted in each video. Participants were then asked to think aloud about what they were seeing, recognizing, and considering while watching each video. After viewing each video, participants were asked a series of open-ended questions aimed at capturing their approach to wheelchair skills training for the specific skill. Interviews were transcribed verbatim. Factors identified through the think-aloud processes and interview questions were combined into a single list of factors considered for each skill. The three student researchers then worked collaboratively to categorize the identified factors and to map each of these factors to a specific code in the International Classification of Functioning, Disability, and Health (ICF) framework. **RESULTS**: The mean length of the six interviews used for this modified think-aloud pilot study was 77.91 minutes. There were 187 factors identified by clinicians: 85 factors (45.45%) were from the Body Functions domain (e.g., mental, physical, and sensory functions), 64 (34.22%) from the Activities and Participation domain (e.g., mobility, learning and applying knowledge, and interpersonal relationships), 32 factors (17.11%) from the Environmental Factors domain (e.g., products and technology and changes to environment), and 6 (3.21%) from the Body Structure domain (e.g., structures related to movement). Mental functions represented 25.67% of all factors, mobility represented 20.86%, and products and technology represented 8.02%. **DISCUSSION**: Participants identified a multitude of factors related to planning and providing pediatric wheelchair skills training indicating that wheelchair skills are highly complex. **CONCLUSIONS**: Based upon the results of this study, the ICF framework appears to be an appropriate coding schema to analyze the clinical reasoning and thought processes of clinicians and to identify factors they consider when thinking aloud about planning and providing wheelchair skills training. This ICF coding schema will be used to analyze data gathered in a larger think-aloud study involving 28 participants from around the world.

Platform Presentation

Track B

**PHYSICAL THERAPISTS’ PERCEPTIONS OF DRY NEEDLING: A QUALITATIVE STUDY.** Eshuis S, Farris L, Greeno J, Webb R, Rose J; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION**:Myofascial trigger points (MTrPs) are hyperirritable loci within a taut band of skeletal muscle or fascia associated with myofascial pain syndromes. Dry needling (DN) is a skilled intervention involving the insertion of a dry (non-medicated), solid, filiform needle into a MTrP for the treatment of pain and movement disorders.An increasing body of research suggests that DN, used in conjunction with exercise and manual therapy, results in short-term decreases in pain and improvements in function. In addition to utilizing the best empirical evidence, the evidence-based practice (EBP) model also includes the acquired judgment of clinicians through their practice. The purpose of this study was to explore physical therapists’ personal experiences using dry needling techniques as part of their work treating individuals with musculoskeletal impairments. **METHODS**: A phenomenological qualitative approach was used to answer the following questions: (1) How do therapists perceive the DN training they received? (2) How do therapists perceive that the inclusion of DN has impacted their clinical practice? and (3) How do therapists perceive DN fits into the EBP model? Physical therapists with at least 1 year of experience who were certified in DN and currently incorporating DN into their practice were recruited via email. Nine physical therapists were screened, and four met the inclusion/exclusion criteria. These four therapists were interviewed using semi-structured Zoom interviews that included nine questions with follow-up questions if necessary. Responses were analyzed using a general induction approach. **RESULTS**: The major themes identified relating to research question one included safety and psychomotor training. The major themes that emerged relating to question two were patient suitability, improved outcomes, and adjunct treatment. The major themes identified relating to research question three were clinician experience and patient values. **DISCUSSION**: Therapists found their DN training to be effective for learning appropriate procedures, identifying red/yellow flags, and learning hands-on techniques. They all agreed that DN is a valuable adjunct modality that leads to improved patient outcomes. Overall, the therapists indicated that their personal experiences and patient values were more influential in their decision to utilize DN as an intervention compared to empirical research. Research limitations included a small sample size that did not allow for data saturation, and the recruitment of active DN practitioners might have biased outcomes. **CONCLUSIONS**: Physical therapists certified in DN perceive it to be a safe adjunct treatment that is valued by patients and that contributes to improved outcomes in patients with MTrPs.

**INFLUENCE OF SPINAL DEFORMITY ON GAIT AND OVERHEAD DEEP SQUAT PERFORMANCE: A COMPARISON OF HEALTHY NORMALS AND SUBJECTS WITH SCOLIOSIS PRIOR TO SPINAL FUSION.** Doorn AJ, Fitkin GL, Kempfer MA, Lee Y; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The prevalence of scoliosis in adults over the age of 60 may be as high as 60%. Altered gait mechanics in people with scoliosis have been shown to lead to increased work and energy expenditure, and they may potentially limit functional endurance. Most past studies have focused on adolescent scoliosis. To date, there has been no biomechanical analysis of individuals with scoliosis during the performance of squatting. However, it has been suggested that the lumbar spine plays a key role in performing a functional squat. The purpose of the study was to collect three-dimensional kinematic and kinetic walking and overhead deep squat (OHDS) data in normal, healthy individuals and to compare this data to those with severe scoliosis that has not yet been treated operatively. It was hypothesized that subjects with scoliosis will exhibit altered kinematics and kinetics when compared to healthy normals during both gait and the performance of the OHDS. **METHODS:** A two arm, unblinded, non-randomized, controlled clinical trial including 12 adult subjects with scoliosis and 12 age- and gender-matched healthy subjects was completed. Sixteen MX-T40 cameras and floor-embedded force plates were used with Nexus motion capture software to gather temporal spatial kinematic and kinetic data from multiple walking trials and three OHDS trials for each subject. Vicon BodyBuilder, Visual3D, and MATLAB software was used to process the raw data. Statistical analysis was completed using SAS JMP software. Independent t-tests were used to analyze between-group differences for demographics and temporal spatial parameters. A two-way ANOVA was performed to determine differences between the groups and between right and left sides. **RESULTS:** In terms of gait, the scoliosis group (SG) demonstrated decreased gait speed (p<0.0001), step/stride length (p<0.0001), cadence (steps/minute) (left p=0.034; right p=0.0447), max hip extension (p=0.0003) and plantar flexion angles (p=0.0004), hip extension (p=0.0004) and ankle eversion moments (p<0.0001), ankle power (p=0.0021), and hip power (p<0.0001). In terms of the OHDS, SG demonstrated increased knee flexion at beginning (p=0.0017) and end (p=0.0071), decreased hip (p=0.0297) and knee flexion (p=0.0247) at bottom, decreased hip (p=0.0110) and knee joint (p=0.0296) moments, and power (hip p=0.0081; knee p=0.0015) while ascending. Frontal plane displacement and ground reaction forces varied between the groups. **DISCUSSION:** This study demonstrated significant differences in gait parameters consistent with previous studies in adolescents with scoliosis and provided novel findings in the analysis of gait in adults with scoliosis. This was also the first study to examine the biomechanical differences of a squatting motion (specifically the OHDS). The subjects with scoliosis demonstrated altered kinematics and kinetics when compared to the healthy normals. **CONCLUSIONS:** There are significant differences in gait and OHDS performance between adults with scoliosis and healthy adults without scoliosis. These differences should be considered in the clinical management of subjects with scoliosis.

**THE EFFECTIVENESS OF THE SCHROTH METHOD IN TREATING IDIOPATHIC SCOLIOSIS IN PRE-ADOLESCENT, ADOLESCENT, AND ADULT PATIENTS: A RETROSPECTIVE STUDY.** Bancuk D, Nutter J, Ramos J, Sobeck C; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Adolescent Idiopathic Scoliosis (AIS) is a spine condition affecting 1-3% of the adolescent population in the United States. Of this group, approximately 0.5% require surgical intervention to correct the curvature.This results in approximately 29,000 surgeries performed in the United States each year on adolescents with AIS. This represents a considerable financial burden along with the risk of surgical complications so exploring conservative alternatives to surgical treatment is a worthwhile area of research.The literature is lacking on the conservative treatment of scoliosis using the Schroth Method as a primary intervention. The purpose of this study was to determine the effectiveness of the Schroth Method on improving the curvature of the spine, pain ratings, and quality of life in pre-adolescent, adolescent, and adult subjects. **METHODS:** A retrospective chart review was performed to examine the research question. A total of 245 subjects met the inclusion criteria (17% males and 83% females). The subjects’ charts were reviewed to compare changes in angle of trunk rotation (ATR), pain level, and the Modified Oswestry Disability Index (m-ODI) at evaluation, progress note, and discharge. Each outcome measure was analyzed for a significant change between evaluation and discharge using the Wilcoxon Signed Ranks Test due to the non-parametric nature of the data, and the difference in efficacy between the age groups was examined using the Kruskal-Wallis Test. The Mann-Whitney U test was used to compare the relative efficacy in outcome measures between the specific age groups. **RESULTS:** Average improvements in the ATR outcome measure included 2.75 degrees for pre-adolescent subjects, 3.47 degrees for adolescent subjects, and 3.4 degrees for adult subjects. Using the ATR outcome measure, there were no significant differences between the groups. Average pain score changes included a 1.21-point improvement for the adolescent subjects and a 2.05-point improvement for the adult subjects. In the pain category, an adult group (ages 18 to 39) performed significantly better than both the adolescent group (ages 10 to 17) and another adult group (ages 40 to 69) when compared with one another. Average improvements in the m-ODI outcome measure included 10.3 points in the adolescent subjects and 20.12 in the adult subjects. Using the m-ODI outcome measure, two adult groups (ages 40 to 69 and 70+) performed significantly better than the adolescent group (ages 10 to 17) when compared with one another. **DISCUSSION:** All age groups improved in the ATR with no significant differences found between the age groups. In terms of the subjective outcome measures of pain rating and m-ODI, both the adolescent and adult groups improved. However, the adolescent group improved the least, which was likely influenced by the initial low scores. The results of this study suggest that the Schroth Method can be an effective treatment in improving function and reducing pain and disability in patients diagnosed with scoliosis. **CONCLUSIONS:** This study supports that conservative treatment such as Schroth Method exercises provided by a Schroth trained physical therapist are effective in treating scoliosis. The Schroth Method's efficacy should be further explored with more detail to specific Schroth interventions and their biomechanical and physiologic mechanisms.

**THE IMPACT, MOTIVATION, AND BARRIERS OF PHYSICAL THERAPISTS PARTICIPATING IN A STUDENT-LED PRO BONO CLINIC: A QUALITATIVE STUDY.** Barrett R, Hoban C, Van Dusen A, Stickler L; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION**: With approximately 28.3 million people uninsured in the United States, the need for pro bono services is essential. While studies in recent years have addressed pro bono services and volunteerism in healthcare professionals such as physicians, surgeons, and dentists, there is a lack of data within the field of physical therapy. The purpose of this qualitative study was (1) to examine the perceived professional and personal impact on physical therapists who volunteer at a student-led pro bono physical therapy clinic and (2) to understand the motivation behind and the barriers to volunteering. **METHODS**: Physical therapists with a minimum of three volunteer sessions at the Grand Valley State University physical therapy pro bono clinic were recruited to participate in individual virtual interviews. All interviews followed a semi-structured format through a pre-established guide of questions, and these interviews were voice recorded. A general inductive approach was used to identify themes and sub-themes. **RESULTS:** Nine licensed physical therapists agreed to participate in interviews conducted on a virtual platform. Three main themes emerged from the data: Professional Elements, Personal Elements, and Community/External Elements. Several sub-themes also emerged. **DISCUSSION:** The motivation to participate in pro bono work and the impact this work had on the physical therapists greatly overlapped, and these factors led to a desire to continue to volunteer. Some of the factors that overlapped included mentoring/working with students, improving cultural competence, and developing clinical skills. The main barriers to volunteering included time constraints and the presence of a language barrier. **CONCLUSIONS**:This study provides support for physical therapists to participate in pro bono care due to the beneficial skills and values developed as an individual and as a professional. Volunteering in the pro bono clinic was a rewarding experience that physical therapists enjoyed and that further motivated them to continue to volunteer.

**PERSPECTIVES OF CLINICAL INSTRUCTORS AND DIRECTORS OF CLINICAL EDUCATION REGARDING DPT STUDENT BEHAVIORS THAT POSITIVELY INFLUENCE A CLINICAL EDUCATION EXPERIENCE.** Malcolm N, Seeger B, Wilkinson K, Ozga K, Kenyon LK; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Clinical education experiences constitute approximately 20% of a three-year Doctor of Physical Therapy (DPT) program and provide student physical therapists with the opportunity to apply didactic information to a variety of clinical situations. The primary purpose of this study was to explore Clinical Instructor (CI) and Director of Clinical Education/Academic Coordinator of Clinical Education (DCE/ACCE) perspectives of DPT student behaviors that positively influence an initial clinical education experience compared to those that positively influence a final clinical education experience. A secondary purpose of the study was to determine if there is a difference in the perspectives of CIs and DCE/ACCEs regarding the importance of DPT student behaviors that positively influence an initial full-time clinical education experience compared to those that positively influence a final full-time clinical education experience. **METHODS:** A survey including 51 DPT student behaviors previously identified in a Delphi study as positively influencing DPT clinical education experiences was conducted online via Qualtrics. On the survey, participants were asked to rate each of the 51 behaviors using a 3-point Likert scale for importance for both an initial and a final full-time clinical education experience and to respond to two open-ended items regarding the two student behaviors they found to be the most important in positively influencing (1) an initial full-time clinical education experience and (2) a final full-time clinical education experience. SAS version 9.4 was used to complete the Generalized McNemar’s test, the Fisher’s Exact test, and a Monte Carlo estimation to calculate p-values for each behavior with a p-value of <0.0001 indicating significant change. **RESULTS:** A total of 161 CIs and 91 DCEs/ACCEs accessed the survey. Anywhere from 62 to 74 CIs and 41 to 63 DCEs/ACCEs responded to items regarding the importance of specific student behaviors.A statistically significant difference in importance ratings between an initial and a final full-time clinical education experience was found for 32 behaviors as rated by CIs and for 10 behaviors as rated by DCEs/ACCEs. A statistically significant difference between CI and DCE/ACCE responses was found for 18 behaviors. Various responses were obtained from the open-ended items. **DISCUSSION:** Behaviors considered to be important in influencing a positive initial full-time clinical education experience may not be as important in influencing a positive final full-time clinical education experience, and vice versa, as there was a significant difference in the importance ratings from an initial to a final full-time clinical education experience. A hypothesized reason that CIs and DCEs/ACCEs did not agree on all behaviors could be due to the difference in the amount of interaction they had with student PTs. Additionally, it was hypothesized that participants possibly grouped one behavior with a similar, more broad behavior when answering the open-ended items. While the majority of the most frequently listed behaviors were rated as ‘’Moderately Important,’’ a few behaviors were identified as ‘’Not Important.’’ The reasons why certain behaviors were rated as “Not Important” was not clear. **CONCLUSIONS:** The majority of behaviors were identified as either ‘’Moderately Important’’ or ‘’Very Important.” CIs and DCEs/DCEs agreed on the importance rating for the majority of behaviors, and behaviors related to interpersonal relationships are important in providing a positive clinical education experience.

**VALIDATION OF INERTIAL MOTION UNITS IN JUMP-RELATED TASKS: A SYSTEMATIC REVIEW.** Dean B, Garcia C, McLaughlin M, Hoogenboom B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Inertial Measurement Units (IMUs) have been introduced as an alternative technology to assess the biomechanics of human movement. Traditionally, 3D motion capture systems (3D-MCS) have been considered the gold standard for capturing human movement during biomechanical analysis. The purpose of this systematic review was to determine the concurrent validity of IMUs compared to 3D-MCS during dynamic jumping activities in normal, healthy, active individuals. **METHODS:** PubMed, CINAHL, PEDro, Web of Science Core Collection, SportDISCUS, and Applied Science & Technology Source Ultimate databases were searched, and articles were screened for eligibility based on the following criteria: studies must have: (1) been peer-reviewed randomized controlled trials or cohort studies of human subjects published in English between 2010-2020; (2) included healthy, active participants who were between the ages of 18-65 and who participated in a sport; (3) assessed jumping-based tasks defined as the generation of linear movements including vertical, horizontal, lateral, or rotational movements that result in the clearance of both feet off the ground; (4) included kinetic or kinematic data collected utilizing IMU and 3D-MCS; and (5) validated an IMU system against a 3D-MCS. The MacDermid Quality Checklist was used to assess risk of bias due to its emphasis on validity. **RESULTS:** A total of 1,295 articles were identified and assessed for inclusion. Five articles met the inclusion criteria, and the necessary data were available for analysis in four of the five studies. The quality of these articles ranged between moderate to moderately high so they were at low risk for bias according to the MacDermid Quality Checklist. Outcome variables assessed included joint angles and jump height. Three studies assessed the validity of IMUs for capturing kinematic data, whereas two studies focused on kinetic data. In the articles assessing kinematics, IMUs demonstrated moderate to excellent correlation with 3D-MCS with greater error present in the transverse and frontal plane measurements. Both articles assessing kinetics used mathematical derivation to determine that IMUs had a greater correlation with 3D-MCS when utilizing flight-time derived jump height compared to those derived from vertical velocity. **DISCUSSION:** IMUs demonstrated moderate to excellent correspondence to 3D-MCS, making them a valid and portable option for clinical utilization during jumping tasks. Articles assessing kinetics via IMUs only examined mathematically derived jump height and did not provide typically obtained kinetic measures such as ground reaction forces, powers, and moments. This limited their utility for kinetic outcomes. **CONCLUSIONS:** IMU technology promotes the biomechanical analysis of athletes during sporting activities. IMUs appear appropriate for the kinematic assessment of sagittal plane-based tasks. Future research needs to be completed to assess the validity of kinematic measurements outside the sagittal plane, kinetic outcomes, and additional high-speed tasks to emulate sport-based movements.

**MEASUREMENTS OF POSTURAL SWAY USING CENTER OF PRESSURE DURING TANDEM STANDING UNDER EYES OPEN AND CLOSED CONDITIONS: A COMPARISON OF NON-CONTACT SPORT ATHLETES AND FOOTBALL PLAYERS.** Henige M, Scieszka J, Wesley N, Alderink, G; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Concussions may go undetected as a result of post-concussion protocols that are not sensitive enough to measure central nervous system (CNS) damage. This results in many athletes returning to play too soon, increasing the likelihood of additional injury and possible long-term damages. The goal of this study was to find a measure appropriate for return to play protocols that may be more sensitive in detecting neurological deficits in football and non-contact athletes who have suffered a concussion. The purpose of the current study was to measure center of pressure (COP) range and mean velocity in anterior/posterior (A/P) and medial/lateral (M/L) directions in collegiate non-contact sport and football athletes while in tandem stance position under eyes open (EO) and closed (EC) conditions. **METHODS:** Nineteen football athletes and seventeen non-contact athletes (cross-country, track and field, swimming, and rowing) participated in the study. All of the participants were 18 to 19 years old, male, and NCAA Division II athletes. An AMTI portable force platform was used to collect ground reaction force data while the athletes were in tandem stance. Each athlete performed five randomized 10-second trials for each of four conditions: right leg back EO, left leg back EO, right leg back EC, and left leg back EC for a total of 20 trials per participant. The data was then extracted using a custom MATLAB program to determine static balance variables: A/P and M/L COP range and A/P and M/L COP mean velocity. The COP variables were exported from EXCEL into SAS JMP and analyzed using a mixed-design ANOVA (P < 0.05) with a Bonferroni correction (P < 0.05/4). **RESULTS:** Within groups, there was a greater mean COP range and velocity in both the A/P and M/L directions in the EC conditions (p < 0.0001). Between groups, a significant interaction between type of sport and eye condition was found in M/L COP mean velocity (P = 0.058), but no significant interaction was found in COP range in either direction. **DISCUSSION:** The current study is consistent with previous studies in suggesting the importance of the visual system on postural control. The elimination of the visual system results in less input to the CNS and a subsequent decrease in postural control. **CONCLUSIONS:** The results showing differences in COP velocity and COP range with EO and EC during static tandem stance may assist in future decision-making related to return-to-play for concussed athletes as it demonstrates potential changes in the athletes’ stability. Consistent with previous research, this study emphasized the importance of assessing the balance abilities of athletes in both EO and EC conditions with a challenging stance. Assessing balance in neurologically challenging environments highlights which regulatory systems may not be functioning optimally when balance task demands are increased. **ACKNOWLEDGEMENTS**: Tonya Parker, ATC, PhD; Yunju Lee, PhD; David Zeitler, PhD.

**MEASURES OF SKIN TURGOR IN HUMANS: A SYSTEMATIC REVIEW OF LITERATURE.** Farran J, Laughlin C, Seelman S, Goehring M, Williams B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** The primary purpose of this study was to conduct a systematic review to determine if there is a consistent method in the literature to measure skin turgor in humans. A secondary purpose was to determine if that method is valid and reliable. **METHODS:** Topics of interest for skin turgor assessment included dehydration, skin integrity including wounds and skin flaps, and fluid/electrolyte balance for adults aged 18 years and older. PubMed, ProQuest Medical, SportDISCUS, PEDro, Web of Science Core Collection, and CINAHL Complete were the databases utilized. Levels of evidence were established using the 2011 Oxford Centre for Evidence-Based Medicine (OCEBM) scale. Methodological rigor was assessed using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) checklist. Two researchers graded the level of evidence and methodological rigor of each included study with a third researcher used as a tie-breaker. **RESULTS:** Thirteen articles were included in the final analysis. There were four articles with level 2 evidence, one article with level 3 evidence, and eight articles with level 4 evidence. Methodological rigor scores ranged from 3 to 13/14. Of the 13 articles, the pinch test was the most commonly utilized method for measuring skin turgor. **DISCUSSION:** There lacked consistency in the methodology and the analysis of results across all the studies that used a skin turgor measurement tool. Several studies used skin turgor as an analysis but did not give clear details in the method about how it was used or analyzed. Some studies used devices to assess skin turgor. **CONCLUSIONS:** There is a clear lack of consistency in methodology and analysis for assessing skin turgor so there is no current reliability or validity in any method. Skin turgor is not an appropriate assessment tool for any condition or purpose for adults.

**PHYSICAL THERAPY AND PATIENT OUTCOMES FOLLOWING UNI-COMPARTMENTAL KNEE ARTHROPLASTY IN A GERIATRIC FEMALE: A CASE REPORT.** Martuch Robison M, Green M; Grand Valley State University, Grand Rapids, MI.

**BACKGROUND AND PURPOSE:** Total knee arthroplasty (TKA) is a common procedure that is performed for improved overall quality of life, functional ability, and health. The procedures and techniques used to perform a TKA have become more refined and with this improvement, there has been a demonstrated increase in the number of uni-compartmental knee arthroplasty (UKA) surgeries, considered to be the more “conservative” treatment. Although there is not a lot of research on UKA outcomes, reports suggest that complications such as an increased rate of osteoarthritis in the contralateral compartment, retained cement fragments, component loosening, and periprosthetic fracture can result. The purpose of this case report was to provide insight into the therapeutic outcomes, duration of therapeutic services, and outline of interventions following UKA in a geriatric female who received continuous passive motion (CPM) for approximately two weeks following surgery and prior to receiving formal therapy. **CASE DESCRIPTION:** The patient in this case was a 73-year-old Caucasian female who reported left knee pain of greater than 2 years that had been previously managed with at least two series of corticosteroid injections and regular activity. She elected to receive a left knee UKA of the medial compartment with a Mako™ tibial incision. The patient reported no surgical issues and was sent home with a CPM for 2.5 weeks prior to beginning physical therapy. She presented to outpatient physical therapy services ambulating with a single point cane, an antalgic gait pattern, significant left knee stiffness, and an inconsistent heel strike through her left lower extremity. She reported pain that was at a 3/10 on arrival and stated that it increased to a 7/10 during prolonged sitting or standing, walking without an assistive device, and stair climbing. She managed her pain with Tylenol. Interventions included manual therapy consisting of stretching and mobility techniques, grade III-IV anterior and posterior knee mobilizations with traction, strength training, gait training to improve heel strike, stair ascent and descent training, and functional mobility. **OUTCOMES:** The patient completed 18 sessions of therapy over 8 weeks and reported feeling like she had made significant progress (about 85%) since beginning physical therapy. She improved her active left knee flexion range of motion from 65 degrees to 104 degrees and her active left knee extension range of motion from lacking 20 degrees in sitting to lacking 4 degrees in sitting. She reported no pain limitations and minimal deficits in her walking, sitting, transfers, and stair tolerance; and she was able to perform stairs with a reciprocal gait pattern and one upper extremity assist using a railing. She also decreased her 5 time sit to stand performance from 25.4 seconds to 13.2 seconds, increased her LEFS score from 49.5 to 58.6, and increased her FOTO score from 60 to 67. **DISCUSSION:** This case had an intervention protocol with an initial 2.5 weeks of CPM prior to starting physical therapy. The patient did improve but required a significant amount of therapy to produce positive outcomes. Future research is recommended regarding this approach.

**FUNCTIONAL OUTCOMES IN BLOOD FLOW RESTRICTION TRAINING FOR REHABILITATION OF THE KNEE: A SYSTEMATIC REVIEW.** Johnson R, Paul M, Ray H, Hoogenboom, B; Grand Valley State University, Grand Rapids, MI.

**INTRODUCTION:** Knee injury and pathology are highly prevalent musculoskeletal (MSK) conditions. Low-Load Blood Flow Restriction (LL-BFR) training has demonstrated the ability to increase muscle strength in healthy and injured individuals and is a potential tool in clinical MSK rehabilitation. The purposes of this review were to determine the role that LL-BFR has on functional outcome measures and to provide summary recommendations for the use of LL-BFR in clinical MSK rehabilitation for patients with knee injuries and conditions. **METHODS:** A literature search was conducted across PEDRO, PubMed, Web of Science Core Collection, CINAHL, and SportDISCUS. The search results were narrowed to randomized controlled trials that were written in English, studied a population between the ages of 18 and 85 years old who had a MSK knee pathology, included at least one functional outcome measure, and used LL-BFR during rehabilitation. Two independent reviewers extracted study characteristics and functional outcome measures. The included article quality was assessed using the PEDro Scale. **RESULTS:** Eight included studies examined outcomes in patients with knee osteoarthritis (OA) (n=5), patellofemoral pain (n=1), postoperative anterior cruciate ligament repair (ACLR) (n=1), and post-operative knee arthroscopy (n=1). All of the studies were deemed to be of good quality via the PEDro Scale. Seven of the eight studies concluded that LL-BFR was similar to or better than the current standard of care for knee pathologies for improving one or more of the following: pain, pain with function, tolerance to movement, movement-based outcome measures such as the Timed Up and Go and the 5x Sit-to-Stand test, and patient-reported outcomes such as the KOOS and WOMAC. **DISCUSSION:** The results of this systematic review indicated that LL-BFR can be used as an alternative to or as an adjunct to conservative treatment to improve functional outcomes when treating knee OA and patellofemoral pain as well as during postoperative rehabilitation following knee arthroscopy and ACLR. Broadly, the results of this review align with existing literature comparing LL-BFR to heavy load (HL) training related to the development of strength. HL training appears to be superior to LL-BFR training at improving functional outcomes in patients with knee pathologies. However, HL training may be contraindicated during MSK rehabilitation due to the surgical protocol or patient intolerance secondary to pain. Future studies should examine a broader range of MSK conditions, with more standard parameters, while seeking to use a narrower array of outcome measures. **CONCLUSIONS:** LL-BFR training can be used as an alternative or adjunct to conservative treatment during the rehabilitation of several conditions of the knee to improve functional outcomes when HL training is inappropriate or poorly tolerated. There is a need for additional research examining the use of LL-BFR in clinical MSK rehabilitation in conditions where tissue tolerance or pain hinders the use of HL training.