

Abstracts of Poster and Platform Presentations at the 2007 Combined Sections Meeting

■ PLATFORM PRESENTATIONS

DEVELOPMENT OF PERCENTILE REFERENCE CURVES TO TRACK CHANGE IN GROSS MOTOR FUNCTION OVER TIME IN CHILDREN WITH CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: The purpose of this study was to construct reference percentiles for the Gross Motor Function Measure (GMFM-66), stratified by the Gross Motor Function Classification System (GMFCS), for children with cerebral palsy (CP).

NUMBER OF SUBJECTS: Children with CP were initially recruited from 19 publicly-funded regional ambulatory children's rehabilitation programs in the province of Ontario, Canada in the late 1990s to participate in a longitudinal study of motor development. In the current study, we conducted a secondary analysis of data from 650 children. The average age at study onset was 7.6 years (SD = 2.6); 56.3% were male.

MATERIALS/METHODS: Children were examined by trained and reliable raters using the GMFM-66 and the GMFCS. Younger children were examined every 6 months and older children were examined every 9 to 12 months. The method used for data analysis required that we treat observations as cross-sectional, rather than longitudinal. Hence, we established 10 one-year age bands from 2 to 12 years and selected one observation per child in each band. Analysis was conducted on data from 1940 observations of 650 children using the LMS method to create percentiles for each GMFCS level. To evaluate the degree of tracking in GMFM-66 percentiles, we also used pairs of observations for each child to estimate the 50% and 80% percentiles of change in percentile over an average of 12 months.

RESULTS: Estimated reference curves, plotted at the 3rd, 5th, 10th, 25th, 50th, 75th, 95th and 97th nominal percentiles, were produced for each GMFCS level. Intervals of expected change between two percentile measurements conducted over a year are available for 50 and 80% probabilities.

CONCLUSIONS: Therapists now have access to a familiar method to track change over time in motor function of children with CP, aged 2 to 12 years, across all five levels of the GMFCS. Using the probability values produced, therapists can determine if a child is developing as expected, better than expected, or more poorly than expected, given their GMFCS levels.

CLINICAL RELEVANCE: In addition to using the GMFM-66, GMFCS, and motor growth curves to assist with examination, prediction, and intervention planning, therapists now have percentile reference curves to assist them with evaluating gross motor function over time.

RELIABILITY AND VALIDITY TESTING OF THE DAILY ACTIVITIES OF INFANTS SCALE.

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PURPOSE/HYPOTHESIS: The purpose of this study was to test the psychometric properties of the Daily Activities of Infants Scale (DAIS). The DAIS was designed as a discriminative and predictive parent self-completed scale to quantify the variation in opportunities parents provide their infants in terms of development of antigravity postural control and movement exploration, through their daily activities. Activities include the following 8 dimensions: feeding, bathing, dressing, carrying, quiet play, active play, outings and sleeping.

NUMBER OF SUBJECTS: Thirty-five infants born pre-term, and their parents, were recruited from a Developmental Follow-up Clinic associated with a regional Neonatal Intensive Care Unit in Southwestern Ontario. The average gestational age was 29.4 weeks (SD = 3.8) with a mean birth weight of 1300 grams (SD = 720). At the time of participation, 21 infants were neurologically normal and 14 were suspect.

MATERIALS/METHODS: A home visit was conducted by one of three trained and reliable raters. The parent and rater dyad independently scored the DAIS over a 2-hour period. The Alberta Infant Motor Scale (AIMS) and a descriptive questionnaire were also administered. Parents subsequently completed the DAIS over a 24-hour period (time 1), and again two weeks later (time 2). A *t* test was used to compare scores of infants aged 4–7 and 8–11 months. Regression analysis was conducted to determine the relationship between the independent variables age and DAIS score and the dependent variable, AIMS score. Intraclass correlation coefficients (ICCs) and 95% confidence intervals (CI) were calculated between the parents' and therapists' DAIS scores and between parents' DAIS scores over a 2-week period.

RESULTS: Older infants obtained significantly higher total DAIS scores than younger infants ($p < .001$). Age and DAIS score predicted 85% of the variance of AIMS score, with partial correlations of 0.39 and 0.30, respectively. ICCs reflecting inter-rater and test-retest reliabilities were 0.79 (95% CI 0.61–0.89) and 0.87 (95% CI 0.73–.94), respectively.

CONCLUSIONS: The DAIS is a reliable and valid measure of infants' daily activities.

CLINICAL RELEVANCE: Our next steps will be to test the contribution of daily activities, as measured by the DAIS, to the acquisition of early motor development of full-term infants and infants at risk for neuromotor disabilities, over and above personal factors and physical, social, and attitudinal aspects of the environment. Subsequent work will focus on testing a variety of methods of collaborating with parents to enhance the use of daily activities to optimize infant motor outcomes.

PREDICTIVE VALIDITY OF THE TEST OF INFANT MOTOR PERFORMANCE SCREENING ITEMS (TIMPSI).

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PURPOSE/HYPOTHESIS: The Test of Infant Motor Performance Screening Items (TIMPSI) is a short version of the Test of Infant Motor Performance (TIMP) for use with infants from 34 weeks postconceptional age through 4 months post term. The purpose of this study was to assess the validity of the TIMPSI for predicting same-age performance on the TIMP.

NUMBER OF SUBJECTS: Subjects were 990 infants (52% male) across the suitable age range for the TIMP with varying degrees of risk for poor motor outcome based on perinatal medical complications. The sample was drawn from 11

geographic regions and selected to represent the racial/ethnic distribution of low birth weight infants in the U.S. The sample was 58% white, 25% black, 15% Latino/a, 2.3% Asian and 0.5% Native American; distribution of risk was 35% high, 30% medium, and 35% low risk.

MATERIALS/METHODS: Subjects were tested with the TIMPSI and then with the TIMP within the space of 3 days by testers masked to infant age and medical history. Rater reliability was established via Rasch analysis (fewer than 5% misfitting ratings). TIMPSI scores were correlated with both ages adjusted for prematurity (AA) and with TIMP scores. A receiver operating characteristics curve was used to plot various cutoff scores on the TIMPSI against scores less than $-.5$ SD on the TIMP in order to assess the best combination of sensitivity and specificity for predicting TIMP performance from TIMPSI scores.

RESULTS: The average time to complete the TIMPSI was 22 minutes. The correlation between TIMPSI scores and AA was 0.72 and between TIMPSI scores and TIMP scores was 0.88 ($n = 990$, $P < 0.0001$). A cutoff of $-.25$ SD on the TIMPSI was deemed best for predicting TIMP scores less than $-.5$ SD with sensitivity 72%, specificity 84%, positive predictive validity 63%, negative predictive validity 89%, and overall percent correctly classified of 81%. The false negative rate was 28%.

CONCLUSIONS: The TIMPSI can be used to screen infants for performance suggesting that a full TIMP does/does not need to be done to rule out the presence of delayed motor development.

CLINICAL RELEVANCE: Use of the TIMPSI cutoff of $-.25$ SD should reduce the number of full TIMP tests needing to be done by 69% while missing 28% of low scoring infants.

ATTENDANCE IN A YOUTH FITNESS PROGRAM: A UNIQUE SCHOOL BASED FITNESS PROGRAM TARGETING STUDENTS AT RISK FOR ADULT OBESITY.

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PURPOSE: The prevalence of obesity in children continues to rise despite media attention to this epidemic. Fitness and weight management strategies have been proven effective in changing health in the short term, but efficacy in preventing obesity remains poorly understood. An abundance of evidence exists supporting the inverse relationship between increased activity and decreased obesity. The question remains how to motivate children at risk for obesity to remain active. The purpose of this special interest report is to 1) discuss attendance and completion of a youth fitness program piloted in an urban elementary school and 2) address program modifications utilized to improve attendance and outcomes.

DESCRIPTION: A pilot fitness program was run for 16 weeks, with 2 forty minute sessions a week, targeting students with a BMI for age >80 th percentile. The program was integrated into the school day, immediately following

lunch. Children ages 7 to 12 participated in both programs, with comprehensive fitness tests performed at initial and final sessions. The programs included a warm up followed by 4 stations: cardiovascular, flexibility, nutrition and strengthening. Sessions were designed and instructed by physical therapists. Specific goals included introducing children from underserved communities to the benefits of fitness, thereby reducing BMI and improving overall wellness. The second program was run for 9 weeks, the next school year for the same target population, with 2 sessions a week lasting 90 minutes each. These classes were held immediately after school. Only 6 of the original 17 students completed the first program (35%) while 14 of 15 students beginning the second program followed through to completion (93%). Attendance rates for the first program were 56% and 80% for the second program.

SUMMARY OF USE: The review of these programs allows a unique opportunity to assess how to best motivate children to follow a program through to completion and see the benefits to their fitness level. While both groups show increases in fitness scores, the most valuable findings come in looking at attendance and completion rates. In making minor adjustments to the timing of the program, attendance and completion rates dramatically increased. If children become motivated to participate and improve their attendance, fitness levels and therefore physiologic measurements of obesity should improve as well. Clinical experience, focus on ease of carryover, knowledge of the crisis in childhood obesity and attempts to link PT professionals to the community contributed to the continuation of this innovative program.

IMPORTANCE TO MEMBERS: This program highlights how PTs can effectively integrate their professional expertise toward the prevention of future health issues within the pediatric population while supporting the APTA's Vision 2020 goal as PTs being recognized as wellness practitioners of choice. Solutions to barriers in programming have led to continuation of external funding for school based fitness programming.

SYSTEMIC EFFECTS ON STRENGTH FOLLOWING BOTULINUM TOXIN A INJECTIONS IN CHILDREN WITH CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: Cerebral palsy (CP) is the most common motor disorder in children. Clinical findings include paresis, incoordination, spasticity, and dystonia. Botulinum toxin A (BtA) is often used for the management of spasticity and dystonia in children with CP. Subclinical electrophysiologic changes remote from the site of injection have been reported. The purposes of this study were to assess: 1) whether there is a reduction in

function and remote muscle strength in children with CP following injection with BtA and 2) whether effects are related to injection dose. We hypothesized that there would be no change in function or remote muscle strength from baseline to peak dose effect (~1-month).

NUMBER OF SUBJECTS: We studied 21 pediatric subjects with spastic hemiplegic or diplegic CP (7 female, 14 male; 4.3–14.7 years, mean 7.7; 15 diplegic, 6 hemiplegic).

MATERIALS/METHODS: Subjects receiving BtA (doses of 2.8–19.8 U/kg body weight (Botox®) injections in lower extremity (LE) muscles were assessed at baseline (day of injection) and 1-month later for changes in upper extremity (UE) strength (hand-held dynamometry), function (Pediatric Outcomes Data Collection Instrument, PODCI), and spasticity (Modified Ashworth Scale, MAS). Each subject performed 3 trials of resisted isometric shoulder flexion, shoulder abduction, elbow flexion, elbow extension, and hand grip. The patients' parent/caregiver completed the PODCI. Data was analyzed as an aggregate and by dose effect (0–10 vs 11–20 U/kg). A 1-factor, repeated measures ANOVA was performed with a p value set at 0.05.

RESULTS: There was no significant reduction in UE strength regardless of the dose received ($P = 0.11-.74$, NS), with the exception of right grip strength which increased ($P = 0.01$) one month after injection. There was no significant reduction in function in subscales of the PODCI for global function ($P = 0.54$), UE and physical function ($P = 0.82$), transfers/basic mobility ($P = 0.20$), or sports/physical function ($P = 0.71$) regardless of dose received. There was a significant reduction in MAS scores in bilateral gastrocnemius and soleus muscles that was dose dependent ($P < 0.0001$). There was no significant change in MAS scores in the hamstring ($P = 0.11$), adductor ($P = 0.71$), and quadriceps muscles ($P = 0.08$).

CONCLUSIONS: We found no reduction in function or upper extremity strength occurred following LE injections of BtA (Botox®) with doses up to 20 U/kg of body weight. This treatment dose does not result in systemic effects as indicated by reduced patient function or strength of remote muscles.

CLINICAL RELEVANCE: A greater knowledge of the therapeutic benefit and side effects at higher doses may optimize medical and therapy interventions for this patient population. Funding for this project was provided by NIH grants R21HD048972-01, K23NS43351, and R21HD048972 and a fellowship training grant from Allergan.

FREQUENCY OF USE OF PEDIATRIC ASSESSMENT MEASURES: A NATIONAL SURVEY OF PEDIATRIC CERTIFIED SPECIALISTS.

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PURPOSE: Results of a national survey completed by Pediatric Certified Specialists (PCSs) regarding their preferences for pediatric assessment and outcome measures

will be reviewed. Implications for clinical practice and entry-level education will be discussed.

The purposes of the national survey were to: 1) determine which developmental assessments and outcome measures are used most frequently by Pediatric Certified Specialists in clinical settings, 2) compare the results with an earlier survey of Texas physical and occupational therapists and 3) ask respondents which measures they expect students to be familiar with during full-time clinical Internships.

DESCRIPTION: A five question, online survey was developed based upon an earlier study of Texas PTs and OTs.

141 of 383 PCSs contacted by email completed the survey. Respondents provided information about their practice setting, which assessment measures they most frequently used, the frequency of use of their first choice, the reason why they preferred their first choice, and which measures they expected entry-level PT students to be familiar with when beginning an Internship.

RESULTS: All practice settings were represented, the three most common being Out-Patient (39%), Schools (21%) and Early Childhood Intervention (13%). The three most frequently used assessment tools were the PDMS (33%), BOTMP (16%), and the AIMS (11%). A category comprised of "Other" (19%) included 120 different measures. The top three reasons for choosing a measure were clinical relevance (31%), easy to score/interpret (19%) and ease of administration (18%). The most frequently used outcome measures were the GMFM (78%), the PEDI (60%) and the School Function Assessment (32%). Ninety PCSs who were also clinical instructors expected students to be familiar with the PDMS (24%), GMFM (24%), PEDI (11%) and BOTMP (10%).

SUMMARY OF USE: A large number of assessment measures are available and used by pediatric physical therapists. This study can guide faculty in how to selectively teach entry-level pediatric content in preparation for internships and also be used by practicing therapists in mentoring students or clinicians who are new to pediatric practice.

IMPORTANCE TO MEMBERS: The pediatric section of the APTA has compiled a non-inclusive list of 67 assessment tools, however, there is no data on which tools are frequently used by practicing PTs. Entry-level educational programs have limited time devoted to pediatric content. Determining which measures are the most frequently used clinically can assist educators in prioritizing what content to emphasize and better prepare students for pediatric Internships. Further research is needed to determine if there are regional differences, given that results from an earlier Texas survey differ from the national survey.

LINKING FAMILY AND COMMUNITY ECOLOGY WITH CHILD DEVELOPMENTAL OUTCOMES AMONG NEVADA EARLY HEAD START (NEHS) ENROLLEES.

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PURPOSE/HYPOTHESIS: Long-term outcome studies suggest that modifying the environment of children with developmental delay or disabilities by supporting families and caregivers may be more effective than direct hands-on intervention. This approach, based on ecological and dynamic systems theories, purports that motor development is affected by various factors intrinsic and extrinsic to the child. Task-specific experience has been identified as the single most important factor that influences motor development. The purpose of this study is to examine relationships between specific ecological variables in children's natural environments and their developmental outcomes as a first step toward identifying how to support children in gaining the experience they need.

NUMBER OF SUBJECTS: The sample consists of 130 children and families randomly selected from University of Nevada, Reno Early Head Start (UNR-EHS) enrollees who had completed the Family Development Matrix (FDM) and >1 child developmental outcome measures.

MATERIALS/METHODS: Using a case-control design, we examined existing data collected regularly by UNR-EHS programs including demographics, the FDM, Ages and Stages Questionnaires (ASQ), and other child developmental measures.

RESULTS: Among our findings, we identified significant correlations of moderate strength ($r = 0.4-.6$, $P < 0.05$) between scores in many developmental domains with scores in same domains in proximal age groups. We also found moderate correlations between family supervision and communication scores ($r = 0.451$, $P = 0.028$) and family nurturing skills and communication scores ($r = 0.407$, $P = 0.006$).

We identified weak but significant correlations between coping skills and gross motor scores ($r = 0.354$, $P = 0.02$). We also found significant correlations of moderate strength among some environmental factors (e.g. nurturing and discipline styles). Of the demographic factors examined, the number of children in the family had weak but significant inverse correlation with problem solving skills at 24 months of age ($r = -.373$, $P = 0.008$) and a moderate significant inverse correlation with gross motor skills at 27 months of age ($r = -.481$, $P = 0.002$).

CONCLUSIONS: We did not identify any strong significant correlations between the environmental factors suspected to influence motor development and children's motor developmental outcomes. A few of these factors had a moderate correlation with communication outcomes. Demographic factors that reflected similar constructs to the FDM demonstrated similar results.

CLINICAL RELEVANCE: To our knowledge, the specific environmental variables that influence the child's ability to obtain experience critical to development have not previously been identified. This information is critical if therapists are to provide effective support-based interventions. Further investigation is necessary to ensure that therapists are able to provide appropriate environmental modifications to enhance developmental outcomes in young children.

OUTCOMES OF CYCLING AND/OR ELECTRICAL STIMULATION FOR CHILDREN WITH SPINAL CORD INJURY.

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PURPOSE/HYPOTHESIS: Determine the effects of cycling and/or electrical stimulation on the musculoskeletal, respiratory, and cardiovascular systems of children with spinal cord injury (SCI).

NUMBER OF SUBJECTS: Fifteen subjects, ages 9.5 ± 2.3 years, with ASIA A or ASIA B SCI of at least one year duration participated.

MATERIALS/METHODS: Subjects were randomly assigned to one of three interventions: functional electrical stimulation (FES) cycling, passive cycling (PC), and electrically stimulated exercise (ES). Children exercised for one hour three times per week for 6 months at home. Data collected included stimulated strength of the quadriceps and hamstrings, bone mineral density (BMD) of the hip and knee, lipid profiles, and oxygen consumption during maximal upper extremity ergometry.

RESULTS: Stimulated strength of the quadriceps muscles improved for subjects in the FES (1.8 ± 0.8 to 3.3 ± 0.4 N/kg) and ES groups (1.0 ± 0.5 to 1.8 ± 0.4 N/kg), but not for those in the PC group (1.7 ± 1.1 to 1.7 ± 0.9 N/kg). In contrast only the subjects in the PC group showed improvements in hamstring strength (2.0 ± 1.2 to 2.6 ± 0.8 N/kg) with no changes seen in the FES (1.9 ± 0.7 to 1.8 ± 0.4 N/kg) or the ES (2.0 ± 1.4 to 2.0 ± 1.1 N/kg) groups. BMD at the hip improved for subjects in the FES (0.36 ± 0.18 to 0.49 ± 0.08 g/cm²) and PC groups (0.37 ± 0.21 to 0.42 ± 0.12 g/cm²) but declined in the ES group (0.55 ± 0.06 to 0.49 ± 0.06 g/cm²). At the femur and the tibia, only the FES group showed increases in BMD (femur 0.29 ± 0.04 to 0.36 ± 0.02 g/cm², tibia 0.30 ± 0.07 to 0.38 ± 0.03 g/cm²), with declines or no changes seen in the PC (femur 0.36 ± 0.12 to 0.34 ± 0.07 g/cm², tibia 0.37 ± 0.07 to 0.35 ± 0.05 g/cm²) and ES groups (femur 0.38 ± 0.07 to 0.37 ± 0.08 g/cm², tibia 0.41 ± 0.08 to 0.37 ± 0.04 g/cm²). All subjects showed a decrease in triglycerides over time but no clear trends were seen between groups or for the other lipid measures (total cholesterol, HDL, LDL). Oxygen consumption during maximal arm

ergometry increased for subjects in the FES group (7.1 ± 1.2 to 9.9 ± 4.3 ml/kg) but declined for subjects in the PC (15.4 ± 2.9 to 12.2 ± 4.7 ml/kg) and ES groups (17.8 ± 10.2 to 13.8 ± 6.5 ml/kg).

CONCLUSIONS: The greatest overall changes were seen in the FES group; however improvements were also seen in the PC and ES groups, indicating that all 3 interventions can provide benefits to children with SCI.

CLINICAL RELEVANCE: Children with SCI are at risk for secondary complications affecting the musculoskeletal, respiratory, and cardiovascular systems. Cycling with FES has led to improvements in adults with SCI, but no studies have examined these effects in children or have compared the effects of FES cycling to those of passive cycling or electrical stimulation alone.

EFFECTS OF POWER WHEELCHAIRS ON THE DEVELOPMENT OF CHILDREN AGED 14 TO 30 MONTHS WITH SEVERE MOTOR-RELATED FUNCTIONAL LIMITATIONS.

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PURPOSE/HYPOTHESIS: To identify effects of power wheelchairs on the development of young children with motor-related functional limitations that prevent independent locomotion.

NUMBER OF SUBJECTS: Participants were a convenience sample of 22 children with a variety of diagnoses aged 14 to 30 months at the beginning of the year-long study.

MATERIALS/METHODS: After matching pairs of children on age, diagnosis, and mothers' education level, they were randomly assigned to the experimental (power wheelchair) group or control group. At entry to the study (baseline) and after 12 months we compared cognitive, communication, motor, social-emotional, self-help, and mobility skills of the groups, as measured by the Pediatric Evaluation of Disability Inventory (PEDI) and the Battelle Developmental Inventory (BDI).

RESULTS: At baseline the groups did not differ on any measures. After one year, both groups' subtest and total scores on the BDI and PEDI increased compared with baseline scores, except the BDI expressive communication subscale both groups, BDI gross motor scale for the control group, and PEDI social function scale for the control group. Comparing the change in the groups' scores from baseline to one year, the experimental groups' BDI receptive communication, and their PEDI mobility functional skills, mobility care-giver assistance, and self-care caregiver assistance scores improved more.

CONCLUSIONS: The study provides support for the use of power mobility to enhance the development of young children with severe motor limitations. It also showed

that children as young as 14 months can begin to use power mobility and become proficient by 20 months. Based on previous research, we expected the children in the experimental group to have greater increases in cognitive and social development than children in the control group. Our results suggest that using different measures with more homogenous children may show such differences. Opportunity for practice using the power wheelchair appears to be an important variable.

CLINICAL RELEVANCE: Children as young as 14 months of age can begin to use power mobility and can become proficient by 20 months. Children require multiple practice opportunities to become proficient and the amount of practice needed for each child to gain proficiency varies. Physical therapists should consider power mobility as an intervention that promotes independent mobility and continued development for young children with motor-related functional limitations.

WINDOWS ON EMERGING RESEARCH IN HIGH-INTENSITY PEDIATRIC CONSTRAINT INDUCED MOVEMENT THERAPY: NEW DATA ON DELIVERY METHODOLOGY.

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PURPOSE: To present data on a manual-based pediatric Constraint Induced Movement Therapy (CIMT) protocol. This model incorporates a community-collaborative component that creates cost-efficiencies, while keeping the intensity and outcomes seen in standard CIMT. Data will¹: describe learning rates in structured tasks that train non-professionals and professionals with limited CIMT experience to select and advance task difficulty, and accurately deliver CIMT shaping exercises²; document the integrity of exercise delivery by various classes of providers (PT, OT, psychology, volunteer, family, technician); 3) assess the level of CIMT knowledge (related to shaping) in classes of providers; 4) report levels of satisfaction with the program, and (5) contrast this professional-community collaboration model and an all-motor-therapist model in terms of cost and clinical outcomes.

DESCRIPTION: High intensity CIMT remains the sole methodology repeatedly shown to produce functional upper extremity changes in adults and children with hemiplegia. We will demonstrate supportive data for a model that can make this treatment modality more affordable to deliver. A large number of structured tasks (100) have been created with the flexibility (multiple difficulty levels; impairment-specific adaptations) to meet individualized treatment needs of children with hemiplegia. Typical tasks and demonstrations of their flexibility and adaptability for children with diverse challenges will be presented. The consistency of training effectiveness

will be shown through descriptive data on these tasks in 25 children. Mean improvement across 500 initiated levels of tasks (>50,000 training trials) was a 38% reduction in time to complete. Integrity of task delivery and shaping procedures is 80–90% across all delivery agents. Only parents are less accurate than other classes of deliverers (one way ANOVA, $P < 0.05$). Descriptive programmatic and effectiveness data illustrate that providing high-intensity CIMT to children with brain injuries is highly cost-effective (non motor-therapist delivery hours >60% of total; cost structure to be enumerated).

SUMMARY OF USE: This protocol, with its structured tasks and specific procedures has been used in children from toddlers through older teens. It has shown success in children with acquired brain injuries; our preliminary data indicate similar outcomes in congenitally injured children.

IMPORTANCE TO MEMBERS: The role of intensity in neurorehabilitation is becoming an unquestionable fact. There is no practical way for physical therapists operating in any widely available delivery model to provide the hours of treatment that CIMT and other intensive neuro-rehabilitative interventions require. The PT can be the director, problem solver and supervisor of such treatments, while other individuals provide less expensive practice hours. This allows PTs to achieve desired outcomes, maintain professional control and safety, and maximize efficiency in clinical settings.

CLINICAL CHARACTERISTICS OF HYPOTONIA: A SURVEY OF PEDIATRIC HEALTH CARE PROFESSIONALS.

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PURPOSE/HYPOTHESIS: Hypotonia is a term commonly used among pediatric health care professionals, yet an operational definition has not been developed. A previous study on hypotonia surveyed pediatric physical and occupational therapists to determine the characteristics commonly observed in children with hypotonia. This study's purpose was to follow-up on the previous study's findings by increasing the sample size and seeking further clarification of those results.

NUMBER OF SUBJECTS: A random sample of 500 physical therapists from the Pediatric Section of the American Physical Therapy Association and 500 occupational therapists from the Developmental Delay Section of the American Occupational Therapy Association were surveyed.

MATERIALS/METHODS: A survey with open and closed-ended questions was mailed to the random sample. The 8 characteristics identified in the previous study were decreased strength, hypermobile joints, increased flexibility, rounded shoulder posture, leaning on supports, delayed motor skills, poor attention/motivation, and

decreased activity tolerance. This study's respondents were asked for level of agreement with these characteristics and to rank order them in frequency of occurrence. The current survey also asked about diagnostic/assessment tools, interventions, and prognosis. Frequencies, means and standard deviations were calculated for each response.

RESULTS: The response rate was 26.8% with 268 surveys returned. The respondents had the strongest level of agreement and ranked as most common the characteristics of decreased strength, hypermobile joints and increased flexibility. The characteristics of poor attention/motivation and decreased activity tolerance were the least agreed upon and ranked as the least frequently occurring. Most of the respondents (73.5%) stated that they examined children with hypotonia with either observation or did not use a specific assessment tool, and 85% of the respondents believed that the characteristics seen with hypotonia can be improved with therapy.

CONCLUSIONS: Six of the 8 previously identified characteristics were identified as components of hypotonia by this study's respondents. Despite the level of agreement among physical and occupational therapists regarding these characteristics and the potential for improvement, clear clinical guidelines for the diagnosis and quantification of hypotonia have yet to be determined.

CLINICAL RELEVANCE: Hypotonia is a term frequently used by many disciplines as a component of many pediatric diagnoses, or even as a diagnosis itself. An operational definition does not yet exist, but developing that definition would allow clinicians to employ correct terminology, develop valid testing measures and assess effectiveness of interventions. This study was an early step in the development of an operation definition in that it helped to identify characteristics that occupational and physical therapists believe are associated with hypotonia.

A QUALITATIVE ANALYSIS OF ADOLESCENTS' PERCEPTIONS OF OVERWEIGHT IN CHILDHOOD.

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PURPOSE/HYPOTHESIS: Overweight in childhood has reached epidemic proportions. Childhood overweight is more likely to carry over into adulthood, which can lead to many serious life threatening diseases such as hypertension, diabetes, and heart disease. The purpose of this study was to generate information about the perceptions of overweight from adolescents and possible interventions using qualitative analysis.

NUMBER OF SUBJECTS: The participants were 90 adolescents ranging in ages from 14–18 from a large, ethnically diverse, urban high school.

MATERIALS/METHODS: Students were recruited from the local high school through classroom announcements.

Nine focus groups of ten teens were led by two researchers. The focus groups were held at the high school or at a community agency. There were four structured questions which guided the focus group discussion. The questions centered on the adolescents' perceptions of the origins and seriousness of increasing childhood overweight and possible intervention strategies. Each focus group was approximately one hour in length and was tape-recorded and transcribed verbatim. At the conclusion of the focus group, the participants were asked to complete a brief written demographic data survey.

RESULTS: All the transcriptions were read by two researchers and analyzed using the tools from a qualitative computer software package, NVivo 7. The data was sorted, organized, conceptualized, refined, and interpreted based on grounded theory. Patterns and common themes were identified through constant comparative analysis and coding the data line by line. Differences in the major themes from groups were analyzed based on the attributes of the individuals in the focus groups and of the focus group itself. Coding journals were utilized to systemically reflect the inductive reasoning used throughout the analysis by the researchers.

CONCLUSIONS: The perceptions of the adolescents studied revealed the many facets which influence the teens as they identify issues about overweight in childhood. The major themes from the data analysis indicated the influences of family, media and peers, the pressures of stress and money, the school environment all were significant for teens in informing their opinions and values about their state of health, nutrition and physical activity. Gender and ethnicity were attributes which differentiated some of the perceptions of the adolescents. The adolescents identified five constructs to guide intervention strategies to combat overweight in childhood: increasing choice for nutrition and physical activity during the school day, educational experiences based on hands-on learning about health, nutrition and physical activity, incorporating social influence of peers into interventions and increase role modeling from adults at home and in school.

CLINICAL RELEVANCE: The clinical implications from the study highlight the multisystemic causes of overweight in childhood as perceived by adolescents. The findings might be used by clinicians in designing health promotion programs to increase physical activity and improve nutrition for children.

THE IMPACT OF AN EXERCISE PROGRAM FOR CHILDREN WITH DISABILITIES ON FITNESS, SELF-CONCEPT, AND SOCIAL SKILLS.

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PURPOSE/HYPOTHESIS: Children with disabilities tend to have fewer opportunities for participation with their

peers in after school programs. This general lack of participation may lead to the development of a sedentary lifestyle, poor overall fitness, fewer opportunities for peer socialization, and ultimately a negative self-concept. The purpose of this study was to determine if participation in an after school exercise program would result in improved fitness, self-concept, and social skills in children with disabilities.

NUMBER OF SUBJECTS: The sample consisted of 9 males and 9 females between the ages of 5 and 20 years with a variety of physical and/or cognitive disabilities.

MATERIALS/METHODS: Children with physical and/or cognitive disabilities were recruited for participation in the program through either the local Easter Seals agency or through a letter sent home by related services providers in local school districts. Children were recruited regardless of type or degree of disability, although had to be ambulatory to participate.

Each child was tested prior to initiation of the exercise program to obtain pre-test data. Pre-testing included: a modified presidential fitness test (PFT), energy expenditure index (EEI), body mass index (BMI), and the Piers-Harris II self-concept scale. The children then participated in an 8 week exercise program designed and implemented by physical therapy and special education faculty and students. Each week the number of social interactions, both positive and negative, were tracked by student observers. At the completion of the program, post-testing was conducted.

RESULTS: Results of the PFT, BMI, EEI, and Piers-Harris II were analyzed using paired *t* tests. A statistically significant difference was found ($P < 0.05$) for number of sit-ups completed in one minute (a component of the PFT), BMI, and EEI. No changes were statistically observed in the Piers-Harris II, nor were changes observed in the number of positive social interactions over the 8 week period.

CONCLUSIONS: The results of this study indicated that children with disabilities can improve in measures of fitness as a result of participation in an 8 week exercise program. While improvements in self-concept and social skills were not statistically observed, many parents of the children participating reported perceived improvements in both areas.

CLINICAL RELEVANCE: Physical therapists have an important role in supporting the health and wellness of children with disabilities. This study describes a program designed to improve not only the physical, but also the social and emotional health of these children.

THE INFLUENCE OF KNEE EXTENSOR AND FLEXOR STRENGTH ON KNEE KINEMATICS AND KINETICS OF CHILDREN WITH CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: Abnormal frontal and transverse plane biomechanics, observed during gait in children with cerebral palsy (CP), may contribute to the development of musculoskeletal impairments. Inadequate strength may play a role in the development of these abnormal movement patterns. While strength and gait impairments have been extensively studied in this population, their relationship has received less attention. The purpose of the current study is to investigate the relationships among knee extensor/flexor strength and knee joint kinematics/kinetics during gait, in children with CP. It was hypothesized that deficits in maximum-effort knee extensor and flexor torques would be related to abnormal kinematic and kinetics during self selected gait.

NUMBER OF SUBJECTS: Sixteen subjects with cerebral palsy participated (11M, 5F; mean age: 10.5 yrs \pm 3.2).

MATERIALS/METHODS: Subjects performed walking trials at self-selected speeds with the minimal level of assistance needed to safely complete the task. Three-dimensional kinematics were acquired using an 8-camera VICON motion analysis system (60 Hz). Ground reaction forces were acquired with 3 AMTI force platforms imbedded in the walkway (1560 Hz). Three walking trials were collected for each subject. Joint angles and net joint moments (inverse dynamics approach) were analyzed using Visual 3D software (Gaithersburg, MD). Kinematic variables included peak knee extension angle during mid-stance, peak knee valgus angle (or minimum varus angle), and peak knee external rotation angle. Kinetic variables included peak knee extensor, adductor, and external rotator net joint moments. Maximum isometric torque generating capabilities were acquired using a KINCOM dynamometer. Five maximum-effort trials for knee extensor and flexor capabilities were collected for each subject. Averaged peak torque was normalized to body mass. The relationships among the gait biomechanics (kinematics & kinetics) and the normalized peak extensor/flexor torque were investigated using Pearson's correlation analyses (SPSS software; Chicago, IL).

RESULTS: Maximum effort knee extensor and flexor torques ranged from 0.37–2.4 Nm/kg and 0.04–0.60 Nm/kg, respectively. Peak knee extensor torque was significantly inversely correlated with peak knee valgus angle ($r = -.612$; $P = 0.006$). No other significant relationships were identified among the peak extensor/flexor torques and other gait variables.

CONCLUSIONS: The results of this study suggest that lower knee-extensor torque capability is associated with greater knee valgus angle during self-selected walking, in children with CP.

CLINICAL RELEVANCE: Increased quadriceps muscle strength may be important to maintain better sagittal-plane alignment due to the presence of abnormal forces acting on the lower extremity during gait in

children with CP. Clinical trials investigating the effects of knee extensor strengthening on gait mechanics in children with CP are needed to adequately examine this relationship.

CHARACTERIZING POSTURAL SWAY IN INFANTS WITH TYPICAL VERSUS DELAYED DEVELOPMENT OF SITTING.

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PURPOSE/HYPOTHESIS: The purpose of this study was to examine differences in postural control in young infants who were developing upright sitting typically, and those who showed delayed development. We used center of pressure (COP) data from infants learning upright sitting behavior to identify measures of variability of postural sway that can distinguish between the two populations.

NUMBER OF SUBJECTS: Eight developmentally delayed (DD) infants (mean age = 14.8 mo, std = 2.8); and seven typically developing (TD) infants (mean age = 6.2 mo, std = 1.1) participated in the study. DD infants were diagnosed with cerebral palsy ($n = 4$) or were developmentally delayed and at risk for cerebral palsy. All TD infants scored above -0.5 std on the Peabody Developmental Scale.

MATERIALS/METHODS: Infants were recruited when they were just developing the ability to sit upright. Each came to the lab twice per month for four months and three trials were recorded at each session. Each trial consisted of recording COP data at 240 Hz for 8.3 sec of unsupported sitting on a force plate. The COP data were analyzed using both linear and nonlinear measures of variability. The linear measures included root-mean-square, range, length of sway path, and area of circle/ellipse encompassing 95% of the sway path area. The nonlinear measures included approximate entropy, Lyapunov exponent and correlation dimension. These nonlinear measures quantify the nature of the variability in the time series data; e.g. the Lyapunov exponent quantifies the stability of data over time. t tests were used to compare the DD and TD groups. Correlations were calculated between each of the measures of variability for 157 trials for each group ($\alpha = 0.00001$).

RESULTS: t tests showed the TD and DD groups were significantly different in the majority of measures used. Correlations of the Lyapunov exponent with other measures also differed between the groups. For the TD infants, linear measures of variability were negatively correlated with each nonlinear measure of variability from postural sway data. The negative correlations with nonlinear measures of variability were also observed in DD

infants for approximate entropy and correlation dimension. However, the Lyapunov exponent was found to be positively correlated with linear measures of variability in the DD group.

CONCLUSIONS: These preliminary results from an ongoing study found that TD and DD infants could be distinguished by the variability measures of the COP, and by the nature of the correlation between the Lyapunov exponent and linear measures of postural variability.

CLINICAL RELEVANCE: Early intervention has been shown to give significant advantages to infants with developmental delay. However, identification of those infants who might benefit from therapy is key to the appropriate allocation of services. Nonlinear techniques may reveal small increments of change in postural control that are not apparent using standard techniques. These sensitive measurement techniques could provide a means of identifying those infants who are responding positively to therapeutic intervention.

■ POSTER PRESENTATIONS

DEVELOPMENT OF MODELS OF THERAPY FOR DETERMINING FREQUENCY AND DURATION OF SERVICES IN THE PEDIATRIC MEDICAL SETTING.

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PURPOSE: The purpose of this special interest presentation is to describe the models of therapy that were developed to help physical therapists and occupational therapists decide frequency and duration of therapy services in a pediatric academic hospital setting.

DESCRIPTION: Models of therapy (MOT) were developed for use by physical and occupational therapists at our facility when treating inpatients and outpatients. The MOT were developed to assist therapists in treatment planning and to educate the patient, family and referring physician regarding changes the child will experience in frequency and duration of therapy as the child's needs change. The models also help to outline our ethical obligation to plan for discharge throughout the treatment process and terminate services when appropriate. The MOT acknowledge that it is expected that patients will transition through the various treatment models as appropriate in order to achieve optimal outcomes. The literature reviewed was nonspecific to the hospital setting. Factors to consider were adapted from Iowa's Department of Education Guidelines for Educationally related services and from Montgomery (Pediatric PT magazine 1994). Four models of therapy are described; Intensive (3–11× week), Frequent (1–2× week to every other week), Periodic (monthly or less often but at regularly scheduled intervals) and Consultative (episodic or as needed). A patient example will be described for each

frequency model. Descriptions and guidelines are described in a table format with factors to consider when making treatment decisions. In addition a policy was established in our department which included educating therapists at all locations and providing a worksheet for families and therapists to review together when making treatment decisions. When initiating therapy these documents are used with families and signed by both the therapist and caregiver. It is explained that children will transition through the MOT as necessary.

SUMMARY OF USE: The policy and MOT brochure are reviewed with each family receiving therapy services and with referral sources as needed. The models of therapy have assisted therapists in making treatment decisions regarding frequency and duration. It has allowed for us to serve more children in our area. It has decreased the variation in care among therapists at our facility by providing clear descriptions of each model. An ethical dilemma will be shared in which the MOT were helpful in resolving an issue regarding a child's therapy services.

IMPORTANCE TO MEMBERS: The MOT developed for use in pediatric hospitals will be useful to other physical and occupational therapists who treat children in a medical environment. Future work should describe the utilization of therapy services for diagnostic groups using the MOT as a framework.

THE EFFECT OF AMBIENT LIGHTING LEVELS ON POSTURAL SWAY IN CHILDREN.

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PURPOSE/HYPOTHESIS: The purpose of this study was to determine the effects of different levels of ambient lighting on postural sway during quiet standing in children between the ages of nine and eleven.

NUMBER OF SUBJECTS: Thirty-eight.

MATERIALS/METHODS: Subjects were asked to stand on a force platform (AMTI Accusway) with their feet together and arms along their trunk while looking at a cross projected on a facing wall 7 feet away under different lighting conditions: 1) standing with eyes open in regular light (200 lux); 2) standing with eyes open in dim light (3 lux); 3) standing with eyes closed. Three trials of 30 seconds were completed for each condition in random order of presentation of conditions.

Swayin software was used to calculate the length of center of pressure (LCOP); sway range and sway variability in antero-posterior (SRAP, SVAP) and medio-lateral (SRML, SVML) directions.

RESULTS: The ANOVA for repeated measures revealed a main effect of lighting conditions for LCOP, SRAP, SVAP. Pairwise comparisons revealed significantly more postural sway with the eyes closed condition compared to the dim light and regular light conditions but showed no differences between the regular and dim light conditions.

CONCLUSIONS: The results suggest that children's postural sway is not affected by differences in levels of illumination as was found in the older adult population. Children may depend less on vision for postural adjustments than does the older adult.

CLINICAL RELEVANCE: This study provides unique information on the effects of ambient lighting conditions on postural stability of typical children. Whether children with disabilities would show the same type of response remains to be determined and would be an important continuation of this work. Understanding how typically developing children adjust their posture in altered conditions provides a normative model against which children with disabilities can be compared.

MOTOR OUTCOME AND MOTHER-CHILD INTERACTIONS DURING THE FIRST THREE YEARS OF LIFE.

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PURPOSE/HYPOTHESIS: This prospective longitudinal study investigated the relationship between parent-child interactions and gross motor development during the first 3 years of life and examined the contributions of maternal level of education, socio-economic status (SES), and acculturation to parent-child interaction.

NUMBER OF SUBJECTS: Participants were 60 Mexican-American mothers and their infants. Mothers were stratified based on SES and level of acculturation. Fifty one parent-child dyads completed observations at 1 year of age, 50 at age 2, and 52 at age 3.

MATERIALS/METHODS: Mothers were observed teaching their child a novel task. The teaching sessions were videotaped. Parent-child interactions were coded from the videotapes using the Nursing Child Assessment Teaching Scale (NCATS). Following the teaching session, children's development status was assessed using the Bayley Scales of Infant Development II (BSID II) at 1, 2, and 3 years of age and the Peabody Developmental Motor Scale-2 (PDMS-2) at age 3 years. The Pearson Product Moment Correlation Coefficient and multiple regression were used to examine the relationship between parent-child interactions, demographic information and the children's developmental status at each age. *t* test and ANOVA with repeated measures were used to examine within-group differences based on SES, education, and acculturation.

RESULTS: Coefficients between the NCATS scores at age 1 and 3 and the Psychomotor Developmental Index (PDI) scores and PDMS-2 Total Motor Quotient (TMQ) at age 3 were statistically significant, but not at year 2. SES, maternal level of education, and NCATS total scores explained 32% of the variance in the TMQ. The difference between the mean NCATS scores for high and low level

education, and non-acculturated and acculturated mothers were statistically significant at age 1 year. NCATS scores were stable over the 3 years.

CONCLUSIONS: This study is the first to examine the relationship between motor outcome and parent-child interactions over time. Our results suggest that Mexican-American children of mothers with low levels of education and acculturation, who experience poor parent-child interactions during the first year of life, may be at risk for motor delays which may not be evident until pre-school age. The findings also support other studies that have reported within-group differences in parent-child interaction based on level of acculturation.

CLINICAL RELEVANCE: Parent-child interaction is believed to be central to child development but is seldom the focus of physical therapy interventions. The relationship observed in this study between parent-child interaction and motor development underscores the need for parent-child interaction to be a component of assessments used to make decisions about intervention goals for motor outcomes. However, the results also raise a question about the extent to which intervention that focuses on parent-child interactions but not variables such as education and acculturation can improve motor development of Mexican American children.

GAIT CHARACTERISTICS ASSOCIATED WITH DISEASE SEVERITY AND PROGRESSION IN PATIENTS WITH FRIEDREICH ATAXIA.

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PURPOSE/HYPOTHESIS: To describe gait characteristics of children diagnosed with Friedreich Ataxia (FA) and investigate relationships between gait characteristics and other measures of disease progression and severity.

NUMBER OF SUBJECTS: 39 subjects diagnosed with FA were included in this study. The subjects were participants in a phase II trial to determine the safety and efficacy of new pharmaceutical interventions for FA. Ages of participants ranged from 9–17 years with a mean of age of 13.1 years. Mean number of years of disease duration of the participants was 5.2 years with a range of 1–14 years.

MATERIALS/METHODS: Gait parameters were measured using a Stride Analyzer, a portable gait analysis system that records foot-floor contact data from footswitches in order to calculate gait parameters. A U-step walker and/or assistance by a physical therapist were provided as needed to ensure safety during testing. Parameters were averaged over three 10 meter trials for each participant and temporal and kinematic data summarized

using the Stride Analyzer software. Scores on the International Cooperative Ataxia Rating Scale (ICARS), a composite assessment of neurological function for patients with ataxia and disease duration were used as measures of disease severity. The administration of the ICARS was completed by the neurologist during the participant's initial medical examination prior to the gait analyses. Temporal and kinematic gait characteristics were summarized for the group using descriptive statistics. Pearson correlations were performed to determine to what extent measures of gait velocity (GV), stride length (SL) and double limb stance (DLS) time were related to the above described measures of disease severity. GV and SL measurements were adjusted for variations in the height of the participants (Hof, AL 1996).

RESULTS: Compared to published values of similar aged healthy children, subjects had slower GV (0.873 +/- 0.30 m/sec), longer SL (1.07 +/- 0.22 m) and a decreased gait cycle time (1.36 +/- 0.61 sec.). Double limb stance (DLS) occurred during 33% of the gait cycle compared to the typical 20% in healthy children. The adjusted values for GV and SL, as well as the DLS time correlated significantly ($P < 0.05$) with ICAR scores and disease duration. Absolute values for the correlations ranged between 0.339 and 0.685. Adjusted GV and the ICARS demonstrated the strongest association ($r = -0.685$; $P < 0.001$) in this group of participants.

CONCLUSIONS: Gait parameters, and especially gait velocity adjusted for variations in height, appear to relate significantly to other measures of disease progression in patients with FA.

CLINICAL RELEVANCE: Measurements of GV, SL, and DLS are relatively straightforward to perform in any clinical setting and appear to relate strongly to other measures of disease progression. With recent insight into the mechanisms of the disease pathogenesis and subsequent trials of new therapies, there is an increased need for valid and reliable continuous measures of physical function to document disease progression and severity.

IS GROUP EXERCISE AN EFFECTIVE TRAINING METHOD IN CHILDREN WITH PHYSICAL DISABILITY?: A PRELIMINARY STUDY.

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PURPOSE/HYPOTHESIS: Group exercise training has the potential to aid in addressing the decreased physical fitness, functional independence and self-esteem that are major threats for children with physical disabilities. Unfortunately, research is lacking in this area. The purpose of this study was to evaluate the effectiveness of an eight-week group exercise program completed twice a week on

physical fitness and concomitant changes in self-esteem and functional performance.

NUMBER OF SUBJECTS: A convenience sample of six children with physical disability participated in the group exercise program. Written informed consent/assent was received from the parent/legal guardian and child in accordance with human subjects review.

MATERIALS/METHODS: A single-group repeated measures (pre- and post-training) quasi-experimental design was used to assess the group exercise training program. Eight-weeks of circuit based group exercise were completed twice per week with individualized programs prescribed and supervised by physical therapists. Physical fitness measures included range of motion (ROM), strength, and aerobic endurance (six-minute walk test-6MWT). Self-esteem was measured using the Self-Perception Profile for Children (SPPC) questionnaire and functional performance was assessed with the Canadian Occupational Performance Measure (COPM).

RESULTS: Of the six children, four maintained a 75% attendance rate, qualifying them for inclusion in the final data set. Also, only ROM and strength data for joints and muscle groups trained in exercises common to all the children were used. Small ROM improvements were observed bilaterally for ankle dorsiflexion. No clear trends were found for measures of strength. Three of the 7 muscle groups exhibited increased strength which ranged 9%–20%, 4 had decreased strength by 6%–39%, and one did not change. The 6MWT increased 54 feet or approximately 3%. The SPPC demonstrated an increase in four categories, no change in one category, and a decrease in one category. For the COPM, 3 of the 4 children demonstrated a significant change in both performance and satisfaction, while one showed no change for either measure.

CONCLUSIONS: The observed lack of consistent pre-post physical fitness training changes is largely attributed to the frequency of the exercise training sessions. Adherence to recommended training guidelines (≥ 3 per week) may augment the effects of the exercise program. It appeared based on subject feedback that the peer interactions associated with the group circuit exercise training program contributed to the general trend of improved self-esteem. Furthermore, exercise training appeared to be an effective means for improving perceived functional performance and satisfaction in children with physical disabilities.

CLINICAL RELEVANCE: The results have implications in the design of exercise training programs in children with physical disabilities. In addition, the group dynamic appeared to supplement the training effects and warrants further investigation.

WEIGHT MANAGEMENT INTERVENTION TARGETING OVERWEIGHT LATINO CHILDREN IN LOW-INCOME HOUSEHOLDS.

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PURPOSE/HYPOTHESIS: Childhood obesity, now termed overweight, is a rapidly growing health care issue in the United States. Overweight in children is defined as having a body mass index (BMI) $>95\%$ on CDC growth charts while a BMI between 85–95% qualifies a child as at risk for overweight. The Latino pediatric population is particularly susceptible to overweight and metabolic disorders. Multiple genetic, environmental and cultural factors contribute to the increased risk attributed to this ethnic group. In 2005, the California Center for Public Health Advocacy declared that Orange County, California contained 2 of the top 10 California cities with the most overweight children (32–36%). Concurrently, the 2000 census confirms that in these same cities the Hispanic population is between 46.7–76.1% of the total population.

Also of note is the relationship between low-income Hispanic communities and increased incidence of overweight. In California the Healthy Families program provides health care to children of parents who are ineligible for California's Medicaid program (Medi-Cal) but cannot afford private insurance. A subsidiary, regional program, CalOptima, was designed to provide community health care to children of such working parents in Orange County. The purpose of our study was to investigate the outcome of a unique pediatrician directed weight management program focused on Hispanic adolescents living in Orange County.

NUMBER OF SUBJECTS: Forty-five children (27 male and 18 female) with an average age of 9.8 years.

MATERIALS/METHODS: This 8 week intensive program includes behavior modification, nutrition, fitness, family participation and medical supervision. Components of the study included regular pediatric visits and twice weekly clinic visits for nutrition education and directed exercise (each 1 hour in length). Participants were also encouraged to exercise outside of the clinic (totaling 5 times per week) and to keep a food diary. All of the children were of Latino descent and part of the CalOptima Healthy Families plan. Anthropometric parameters and cardiovascular profile were determined prior to the start of the study and on a weekly basis throughout the duration of the study.

RESULTS: The average weight loss of the subjects at the 8 week time point was 3.9 lbs. ($P < 0.01$) Average BMI % at the start of the study was 98.8, which was significantly reduced to 96.4 ($P < 0.01$). Participants' initial average BMI was 26.3 which was significantly decreased to 24.8 at termination of the program ($P < 0.01$). Waist circumference was significantly decreased at the end of 8 weeks (36.4 in vs 34.5 in; $P < 0.01$). Heart rate, blood pressure, nutritional compliance, and fitness level were also improved at the end of the 8 weeks.

CONCLUSIONS: An 8 week comprehensive approach to pediatric overweight and obesity had a positive impact on

anthropometric profile, cardiovascular health, psychological wellbeing, and exercise tolerance.

CLINICAL RELEVANCE: This program provides a successful framework for interventions targeting underserved, minority populations.

THE EFFECT OF THERATOGS™ ON GAIT IN A 5 YEAR OLD CHILD WITH SPASTIC HEMIPLEGIA.

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PURPOSE: Gait abnormalities often exist in children with spastic hemiplegia. TheraTogs™, an orthopedic undergarment and strapping system, has been recommended to improve gait patterns in children with disability, however little research has been conducted on the effectiveness of the device. The purpose of our study was to determine the effect of TheraTogs™ on the gait pattern of a 5-year-old child with spastic hemiplegia.

DESCRIPTION: A 5-year-old male with spastic hemiplegia who ambulated with a gait trainer walker and bilateral dynamic ankle foot orthoses was recruited for the study. He typically walked 50 feet/day with a scissor gait pattern. The data collection included 5 test sessions; each test session consisted of three trials of ambulating on the GAITRite® electronic walkway. An initial baseline was established on the first test session, after which the TheraTogs™ were immediately introduced and the 2nd test was conducted. The subject wore the TheraTogs™ for 4 weeks; test sessions 3 and 4 were performed after 2 and 4 weeks of intervention. The TheraTogs™ were then removed for 2 weeks and a final test session was performed. The TheraTogs™ were applied according to manufacturer's guidelines for scissor gait. Two heavy split straps were applied to the tank top and thigh cuffs keeping the hips in slight abduction to reduce scissoring. The parent was instructed to have the subject wear the TheraTogs™ 6 hours and ambulate a minimum of 30 feet/day. The parent completed a compliance log on estimated feet ambulated per day. The GAITRite® recorded values for velocity, cadence, and base of support, step time, stride length and toe in/out. The data for right and left sides were averaged for all variables except toe-in/out. A two-standard-deviation band analysis was used for data analysis.

SUMMARY OF USE: During the 4 weeks of intervention, the subject walked an average of 141.8 feet/day. Significant improvements in gait were found for base of support, velocity, and cadence. No significant difference was found for step time, stride length, or right toe in/out. A significant decline showing increased toe-in was found for the left. The carryover effect remained significant for velocity, cadence, and base of support.

IMPORTANCE TO MEMBERS: The results of this study showed improvements for some of the gait dynamics with the use of TheraTogs™. Gait velocity, cadence, and base of support were improved but stride length and step

time were not improved. The results for toe in/out were inconsistent with a decline occurring on one side. This is a single subject case design and generalizability of the results should be considered with caution. The subject had gains in some gait variables and a decline in one variable with the use of TheraTogs™. Considerable gains also occurred in the distance walked/day. Further research should be conducted with a more powerful design to determine if TheraTogs™ or increased distance walked accounted for the change in gait.

EMORY FUNCTIONAL AMBULATION PROFILE: VALIDITY AND RELIABILITY IN CHILDREN 5 TO 7 YEARS OLD WITH AND WITHOUT DEVELOPMENTAL DISABILITIES.

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PURPOSE/HYPOTHESIS: The Emory Functional Ambulation Profile (EFAP) is a valid and reliable measure of functional mobility in adults with neurological impairment. The purpose of this study was to determine if the EFAP is a valid and reliable mobility measure in children with and without developmental disabilities (DD).

NUMBER OF SUBJECTS: Ten children with DD and 18 without DD from two urban school districts participated in the study.

MATERIALS/METHODS: All children were tested on the EFAP in their school. The EFAP consists of five subtasks: walking on a hard floor, walking on a carpet, an "up & go" task, an obstacle course, and stair climbing. Tasks were completed according to the standardized protocol and the time to complete each was recorded. Selected scales of the Activity Performance Physical Task section of the School Functional Assessment (SFA) were completed by each child's teacher or therapist. A Spearman rank order correlation was calculated to examine the relationship between subtask and total scores of the EFAP and criterion scores of the SFA. An ANOVA determined statistical differences between children with and without DD for performance on EFAP subtasks. Interrater reliability between two testers was measured using an intraclass correlation coefficient (ICC).

RESULTS: Significant correlations were found between scores on EFAP carpet subtask and Maintaining and Changing Positions section of the SFA ($P < 0.01$), the EFAP stairs subtask and Travel and Recreational Movement sections of the SFA ($P < 0.03$), and the EFAP total score and Manipulation with Movement section of the SFA ($P < 0.04$) for children with DD. There were no significant correlations between EFAP and SFA scores for children without DD. Significant differences between children with and without DD were found for three of the five EFAP subtasks: carpet walk ($P < 0.02$), up & go ($P < 0.01$) and obstacle course ($P < 0.01$), and total score ($P < 0.01$). The children with DD took longer than

children without DD to complete these tasks. Excellent interrater reliability was found for all EFAP subtasks (ICCs >0.95).

CONCLUSIONS: The EFAP appears to be a valid and reliable measure of functional mobility in children. Convergent validity was supported by significant correlations between specific tasks of the EFAP and scales of SFA, indicating that both assessments identify children who have difficulty with mobility tasks important for school function. Further, three EFAP tasks discriminated between children with and without DD. Excellent interrater reliability makes the EFAP a good option in a school setting where children may see different therapists. Given the findings reported here future research on the EFAP with a larger sample of children is indicated.

CLINICAL RELEVANCE: The EFAP appears to be a sound measure of functional mobility in a school setting. In addition, the test is quick and easy to administer, and low cost making it a good choice when time and resources are limited.

EFFECTS OF CARRYING A LUNCH TRAY ON GAIT PARAMETERS IN CHILDREN 5 TO 7 YEARS OLD WITH AND WITHOUT DEVELOPMENTAL DISABILITIES.

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PURPOSE/HYPOTHESIS: Walking while carrying a lunch tray is a functional task typically performed by children in a school setting. The task requires monitoring of the tray, objects on the tray, the walking surface and activity in the surrounding area. Previous research indicates that when children or older adults walk while performing concurrent tasks interference in postural control and gait can occur. The purpose of this study was to examine the effects of a functional, concurrent manual task on spatial and temporal gait parameters in children 5 to 7 years old with and without developmental disabilities (DD).

NUMBER OF SUBJECTS: Six children with DD and 12 children without DD participated in the study.

MATERIALS/METHODS: Each child walked on a GAITRite[®] instrumented walkway four times under the following task conditions: walking, walking while carrying an empty tray (W T), walking while carrying a milk carton on a tray (WTM) and walking while carrying an apple on a tray (WTA). A 2 × 4 repeated measures ANOVA with leg length as a covariate was used to examine the effects of group and task on gait velocity, cadence and step length. Pairwise comparisons using a Bonferroni correction were made to examine differences between means when significant main effects were found.

RESULTS: ANOVA revealed significant main effects for group ($P < 0.13$) and task ($P < 0.001$) and a significant

group by task interaction for cadence ($P = 0.02$). Pairwise comparisons indicated that group differences were due to velocity ($P = 0.001$) and cadence ($P = 0.023$), not step length. Leg length had a significant effect on step length ($P = 0.009$), independent of group. Pairwise comparisons of tasks found significant mean differences in velocity and step length between the following conditions: walking and WTM ($P = 0.003$); walking and WTA ($P = <0.001$); WT and WTM ($P = 0.014$); WT and WTA ($P < 0.001$); WTM and WTA ($P = 0.007$). Task comparisons for cadence found significant mean differences between: walking and WTA ($P < 0.001$) and WT and WTA ($P = 0.003$). There were no significant differences between walking and walking with a tray for velocity, cadence or step length.

CONCLUSIONS: The children with DD in our study walked more slowly than children without DD under both single and concurrent task conditions. Cadence also decreased between single and concurrent task conditions but more for children with DD, especially for the task of walking while carrying an apple on a tray. This condition was considered most challenging since children had to walk and closely monitor movement of the apple so it would not roll off the tray. Children with and without DD showed a comparative decrease in step length between single and concurrent task conditions.

CLINICAL RELEVANCE: Physical therapy in a school setting should include practicing a range of functional concurrent tasks such as the one used here. The children with DD in our study walked more slowly than children without DD even under single task conditions. Our results indicate that more research is needed on gait parameters in children with DD.

MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY FOR A CHILD WITH RIGHT HEMIPARESIS.

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BACKGROUND & PURPOSE: Previous research has shown that constraint induced movement therapy (CIMT) is an effective method for improving upper extremity (UE) functions in children with hemiparesis. However, the types of constraints and intensity of therapeutic interventions are varied in the literature. The purpose of this case report is to describe the outcomes reached by utilizing a method of CIMT that is easily incorporated into a home program and utilizes a less restrictive restraint than other protocols.

CASE DESCRIPTION: The subject was a 13 month old female with right hemiparesis. The subject used a soft removable mitt to constrain movement of the involved hand and wrist. Caregivers were given verbal and written

instructions on the amount of constraint to be given and age appropriate activities to facilitate while the mitt was on at home. The protocol consisted of three phases: intense training, mitt weaning, and post-mitt. Intense training involved three weeks in which the subject wore the mitt for six awake hours daily. The weaning phase consisted of five weeks of decreasing the mitt time by one hour each week. The post-mitt phase followed where the subject did not wear the mitt for four weeks. The subject was videotaped weekly playing with and without the restraint to assess frequencies and types of grasp, reach, release, and transfers with the involved UE. Two independent investigators videotaped and analyzed each video to ensure reliability and validity of the measures.

OUTCOMES: Qualitative and quantitative improvements were noted with all measures. The subject progressed from reaching with the involved UE 9% of trials before CIMT to 22% of trials post CIMT. The percentage of successful transfers of objects to the involved hand increased from 16% to 83%. The quality of the subject's grasps with the involved hand improved from grasps a palmar or scissors grasp in 100% of trials to more advanced grasps including the three-jaw-chucks and pincers in 54% of trials. The subject's ability to voluntarily release objects from the involved hand (supported and unsupported) increased from 0% to 58%. Functionally, the subject began using her involved UE in bilateral play activities and self-feeding during CIMT. These functional gains persisted at follow up. Flexor tone of her involved UE also decreased over time allowing her to maintain a more open hand position for play. Subjectively, the caregivers reported tremendous satisfaction with the improvements and ease of the protocol.

DISCUSSION: The data suggests dramatic improvements both in the quantity and quality of the fine motor skills assessed during and after a modified, low intensity protocol of CIMT. This protocol was easily administered and carried out by the subject's caregivers. Both of these factors enhance the clinical utility of this intervention dramatically. The improvements observed may be attributed to a reversal of learned non-use of the involved UE as described in the literature and can have far reaching implications for the development and quality of life of this child.

EVALUATION OF SHORT-TERM ORTHOTIC GARMENT USE IN CHILDREN WITH CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: This study evaluated the effectiveness of an orthotic undergarment with a strapping system on the gait pattern, postural stability, balance and life skills of children with mild cerebral palsy (CP).

NUMBER OF SUBJECTS: Five subjects (7–13 years) with diplegic CP participated. All subjects were classified

as Gross Motor Functional Classification Scale (GMFCS) level I. The subjects did not receive physical therapy services during or before the study.

MATERIALS/METHODS: A TheraTog™ garment system was worn for 12 weeks, 10–12 hours per day. The first 2 weeks, the vest and shorts were worn alone. Subsequently, based on the findings from a musculoskeletal lower extremity assessment, a strapping system was developed for each child and worn for the remainder of the 12 weeks. Baseline testing included: Vicon® Motion Analysis of gait, Neurocom Equitest® for postural stability, Bruininks-Oseretsky Test of Motor Proficiency (BOTMP) for balance and gross motor skills, and the Canadian Occupational Performance Measure (COPM) for functional skills/goals. Outcome measures were repeated following the intervention with the garment on and off and at 2 and 4 months. A diary of compliance was recorded and a satisfaction survey was completed at the end of the intervention period to collect parent input.

RESULTS: Kinematic gait data indicated that peak hip extension at terminal stance improved and the improvement carried over until 4 months. Pelvic alignment in the sagittal plane was only impacted with the garment on, tilting the child's pelvis more posterior during gait trials. Neurocom results showed no significant changes on the motor control and adaptation tests, but the limits of stability test showed better directional control of their bodies during active weight shifts in all directions. The composite gross motor scores on the BOTMP improved with the garment on (31%) as well as with the garment off (27%) and the values continued to improve 2 and 4 months after the intervention. The performance score on the COPM improved 19% immediately following the intervention, and at 2 months (28%) and 4 months (20%) post. The satisfaction score on the COPM improved 24% at the end of the intervention, 23% 2 months later and 35% at 4 months post. Wearing compliance was 100% for 2 children and 75% for 3 children. Overall parent satisfaction was good, with the primary complaint that the garment was too hot.

CONCLUSIONS: When used over a 2 month time frame, an individualized orthotic garment with a strapping system can improve gait, postural stability, balance, and life skills in some children with CP, GMFCS level I. Further research is needed to determine if the same effect would be seen in a larger population and with those children who have greater disability. Optimum wear time and duration also require further study.

CLINICAL RELEVANCE: Physical therapists may find these garments to be a useful tool to improve gait, posture, functional skills and balance in children who have CP.

AN INDIVIDUALLY TAILORED PHYSICAL ACTIVITY PROMOTION PROGRAM FOR A NAVAJO NATION FIFTH GRADE CLASS.

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PURPOSE: Physical inactivity is an internationally recognized public health concern, and Native American children are particularly vulnerable for obesity and associated diseases. Most school-based studies on physical activity promotion lack evidence in favor of the intervention. These outcomes may result because programs have not been individually tailored, as supported by behavior change research. The purpose of this program, therefore, was to examine the feasibility of implementing an individually tailored physical activity promotion program for Navajo school children.

DESCRIPTION: The Principal chose a fifth grade class comprised of 22 Navajo children to pilot the program. To individually tailor it, the children identified goals, barriers, strategies to overcome barriers, and people for support. Data was collected on physical activity levels, self-efficacy, self-esteem, body-mass index (BMI) and fitness. For on-going support, children were assigned a physical therapist or DPT student coach to assist in revising goals and activities as needed and to provide motivational support via email. Internet access was available at school.

SUMMARY OF USE: Pre-intervention, self-perceptions were often inaccurate. Six of 10 children with “overweight” BMI inaccurately identified themselves as average or slightly underweight. For many, self-esteem was low: 1/2 were dissatisfied with their looks, 1/3 thought others were better athletes, and 1/3 were unhappy with themselves and wished to be someone else. Few physical activity goals were readily measurable, *i.e.* “throw a football further”, “be the best soccer player ever”. Weather was cited by most as a potential barrier, but strategies to overcome barriers were limited to determination, *i.e.* “practice”. During on-line coaching, children wrote about their families and pets. Little, however, was communicated about physical activities, in spite of prompting by coaches. By mid-year, children rarely sent emails. At the end of the academic year, the school therapist was able to collect data on only 15 children. For these participants, BMI, self-esteem, and activity levels were similar to that pre-intervention. All children with complete data, however, identified enjoying the program and all but one identified attaining or partially attaining their goals.

IMPORTANCE TO MEMBERS: To date, there is insufficient evidence to support an optimal physical activity promotion program that yields clinically meaningful improvements. Our program was initiated by a school-based physical therapist with support from the classroom teacher and email coaches. Problems were encountered because more time than practical was required for data collection and for development of goals and goal attainment plans. Also, coaches via email were unable to keep the children focused on the program’s goals or sustain active communication for the full academic year. Examination of failures in implementation of this program will

help in designing future school-based programs and anticipating required resources.

THE EFFECTS OF BACKPACK CARRYING POSITION ON GAIT KINETICS.

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PURPOSE/HYPOTHESIS: The APTA recommends that student backpacks contain no more than 15% of body weight. Backpack weight has been shown to have adverse effects on posture and gait; however, studies examining backpack position are lacking. The purpose of this study was to determine the effects of different backpack carrying positions on gait kinetics.

NUMBER OF SUBJECTS: Thirteen healthy seventh and eighth grade students, both male and female, participated in this study.

MATERIALS/METHODS: Three different backpack carrying positions were examined in addition to a control condition with no backpack. The backpack carrying positions included: 1.) backpack in the correct position using two straps with the backpack placed in the mid-thoracic area, 2.) backpack in the slung low position using two straps with the backpack placed in the lower lumbar area, 3.) backpack with one strap over the right shoulder worn low over the lumbar area, and 4.) control condition with no backpack. The backpack was loaded with 15% of the subject’s body weight for each condition. Subjects were asked to walk across the GAITRite mat a total of 12 times, 3 times for each condition. The GAITRite system was used to measure the following dependent variables: velocity, cadence, step length, single stance time (SST), and step time. A one-way MANOVA was conducted to determine the effect of backpack carrying position on gait. A univariate ANOVA was then conducted on each variable to determine which variables showed significant group differences. For the variables with significant differences, a Tukey post hoc analysis was used to determine between which groups the differences occurred.

RESULTS: A significant overall backpack position effect was revealed using the one-way MANOVA (Wilks’ Lambda = 0.201, $F = 2.612$, $P = 0.001$). Univariate ANOVAs demonstrated significant backpack position effects on the variables of velocity ($F = 5.901$, $P = 0.002$), right step length ($F = 3.744$, $P = 0.019$), left step length ($F = 4.441$, $P = 0.009$), and left SST ($F = 5.884$, $P = 0.002$). Tukey post hoc analyses showed significant differences in mean velocity, mean right step length and mean left step length between the control and the single shoulder low position. No significance differences were found in cadence, right SST, or right and left step times.

CONCLUSIONS: Subjects exhibited a more conservative gait pattern when backpacks were carried on one shoulder, characterized by a significant decrease in velocity, and step length, when compared to the control condition.

CLINICAL RELEVANCE: The implementation of a more conservative gait pattern when carrying a backpack on one shoulder is likely a compensatory strategy to preserve balance. This study is consistent with previous literature, and supports the recommendation that a backpack should be worn across both shoulders in the thoracic area to avoid gait abnormalities.

COMPARISONS OF PERFORMANCES ON THE STANDARDIZED WALKING OBSTACLE COURSE (SWOC) FOR MATCHED PAIRS OF CHILDREN WITH PERVASIVE DEVELOPMENTAL DISORDER/MULTIPLY-HANDICAPPED AND TYPICAL DEVELOPMENT.

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PURPOSE/HYPOTHESIS: The purpose of this study was to support the construct validity of the Standardized Walking Obstacle Course (SWOC) as a test of functional ambulation and balance by examining standard data in children with and without disabilities. Additionally, this study sought to determine whether differences exist between the two groups in performance on all conditions of the SWOC.

NUMBER OF SUBJECTS: Children with Pervasive Developmental Disorder or educational diagnosis of Multiply-Handicapped (PDD/MH) and typical development ($n = 36$ pairs) were matched by age (range 3 years, 2 months – 17 years, 9 months; mean 7 years 5 months, gender (13 female pairs, 23 male pairs), and Body Mass Index (range 13.9–34.31 kg/m², mean 19.63 kg/m²).

MATERIALS/METHODS: The SWOC is a 12.2 meter (39.5 foot) long and 0.9 meter (36 inch) wide angled (70 degrees and 90 degrees) path with chairs at each end, surface changes (shag rug, colorful mat), and obstacles (large trashcan, standard crutch). Children were randomly assigned a start condition of the SWOC and completed 2 trails each of: arms free, carrying a lunch tray with place setting, and wearing shaded glasses for a total of 6 trials.

The time and number of steps to complete the course, stumbles and/or steps-off the path were recorded. ANOVA and Wilcoxon-signed ranks test were used to analyze the effects of group and condition on the SWOC on time and number of steps, and stumbles and/or steps-off the path respectively. Descriptive statistics were used to examine condition differences in the variables.

RESULTS: There were significant main effects on group and condition for time on performance ($F = 34.438$, $P < 0.0001$; $F = 73.193$, $P < 0.0001$ respectively) and an interaction effect ($F = 4.416$, $P = 0.0139$). For number of steps, both group and condition revealed significant

main effects ($F = 15.454$, $P = 0.0008$; $F = 49.154$, $P < 0.0001$ respectively), however no significant interaction between group and condition was noted ($F = 0.163$, $P = 0.8496$). In comparing the two groups, statistical analysis was significant for stumbles (hands free: $P = 0.0013$, tray: $P = 0.0024$) and number of steps-off the path (hands free: $P < 0.0001$, tray: $P = 0.0001$, glasses: $P < 0.0001$), and condition difference was noted for both groups in steps-off the path carrying the tray versus hands free or glasses.

CONCLUSIONS: There were significant differences on all measures of the SWOC between children with PDD/MH and typical development. Children developing with PDD/MH took a longer time, increased number of steps, and had more stumbles and steps-off the path compared to their peers, especially when carrying the tray.

CLINICAL RELEVANCE: For this group of children, the SWOC is able to distinguish between those with PDD/MH from those developing typically for functional ambulation and balance; therefore, strengthening the construct validity of the functional outcome measure.

ACTIVITY AND PARTICIPATION OUTCOMES FOLLOWING ORTHOPEDIC SURGERY IN CHILDREN WITH CEREBRAL PALSY (CP): A CASE STUDY.

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PURPOSE/HYPOTHESIS: The purpose is to describe the longitudinal changes in the activity and participation levels of children with CP following lower extremity orthopedic surgery and rehabilitation.

NUMBER OF SUBJECTS: 5 children with CP, 5 to 15 years of age ($x = 9.12$ years; $SD = 4.04$ years) ranging in severity were examined. Two subjects had both bony and soft tissue procedures, 2 subjects had soft tissue surgery only, and 1 subject had bony surgery only.

MATERIALS/METHODS: The Gross Motor Function Measure-66 (GMFM-66) and functional skills mobility (FSM) and caregiver assistance mobility (CAM) domains of the Pediatric Evaluation of Disability Inventory (PEDI) were administered on 4 occasions: pre-op, 6 months post-op, 1 year post-op, and 2 years post-op. The Gross Motor Ability Estimator (GMAE) and the scaled scores of the FSM and CAM of the PEDI were recorded for all subjects for each of the 4 testing sessions. All post-op scores were compared to pre-op scores and percentage change calculated. Improvement, maintenance, or decline in functional abilities was determined by comparing the percent change to the minimal detectable change (MDC) (PEDI scaled score = 7 point change and GMAE = 6% change). Intra- and inter-rater reliability ranged from $ICC = 0.995 - 1.000$ for the six raters on the GMFM-66.

RESULTS: All subjects showed meaningful positive outcome, improvement, in at least one score over the two year follow-up period. Additionally, there was no meaningful negative change, decline, in activity or participation measures for any of the subjects. Subject 1 had a positive MDC at 1 and 2 year post-op on the GMFM-66; Subject 2 had a positive MDC at 1 and 2 year post-op on the FSM and CAM of the PEDI and a positive MDC at 6 months on the GMFM-66; Subject 3 had a positive MDC at 6 months and 1 year post-op on the FSM of the PEDI; Subject 4 had a positive MDC at 1 and 2 year post-op on the FSM and CAM of the PEDI; and Subject 5 had a positive MDC at 2 year post-op on the CAM of the PEDI and positive MDC at 1 year on GMFM-66.

CONCLUSIONS: All 5 subjects had a meaningful positive activity and participation outcome regardless of age, severity level, or type of surgery performed. Improvements were noted on different outcomes at different time periods. The majority of change occurred at the 1 and 2 year post-op interval. The activity outcomes improved the most at the 1 year post-op time period while the majority of change on the participation level occurred at the 2 year post-op interval. The improvement is noteworthy since maintenance of activity and participation outcomes might be predicted based upon motor development curves for older children (greater than 5 years of age) with CP reported by Rosenbaum.

CLINICAL RELEVANCE: The results of this study suggest that measuring both activity and participation outcomes provide a comprehensive picture of evaluating change over time following orthopedic surgery. Additionally, evaluating changes following orthopedic surgery and rehabilitation may require testing for at least 1 year post-op.

USE OF QUALITY CIRCLES FOR PROFESSIONAL DEVELOPMENT IN PT/OT SCHOOL-BASED SERVICES.

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PURPOSE: To describe the use of Quality Circles (QCs) for professional development in a faculty practice of PTs and OTs who provide school-based services.

DESCRIPTION: Quality circles are small groups of employees that meet at regular intervals to identify, analyze and solve problems in their work settings. QCs had been successfully applied in the Newark Therapy Services (NTS) academic faculty practice for documentation compliance and clinician mentoring. Multiple strategies had been tried to encourage greater use of evidence-based practice (EBP) processes and critical literature review to inform clinical practice; however, both physical (PT) & occupational therapists (OT) had difficulty increasing their level of literature use. Reasons included lack of EBP skills, lack of time, perceptions of increased work

demands, and lack of relevance to practice. QCs were used to facilitate an explicit shift in the practice culture from intuitive reasoning to EBP. About 35 PTs and OTs identified school-based clinical issues. QCs were selected by interest in an issue, resulting in intra and interdisciplinary groups of 2–5 clinicians. QCs typically met once a month for ten 45-minute sessions to address their clinical challenges with the caveat that all groups were required to use literature to inform their conclusions. QCs used the allocated meeting time, and additional time as needed, to find and discuss source materials, to propose solutions that fit the practice setting, and to prepare presentations for the end of the school year. Mentoring was provided through in-services and peer tutoring on electronic literature searching or analysis. Each group set its own pace for achieving a meaningful clinical outcome. Questionnaires at the end of three consecutive school years have provided quantitative & qualitative feedback.

SUMMARY OF USE: The 3 most identified benefits of using quality circles include the opportunity to collaborate with peers (56%), being more informed on a topic (31%), & having time to discuss work issues (28%). The 3 most identified drawbacks include limited time to complete tasks (29%), the process is time consuming & adds work/stress (23%), & poor organization within groups (17%). While the clinicians still have varying levels of comfort with EBP, there is greater acceptance of its role in practice.

IMPORTANCE TO MEMBERS: Quality circles are typically used to solve administrative or service delivery problems, but were successfully used for professional development of school-based PT and OT clinical faculty. The administration's provision of time for QC meetings, computer access for literature searching, discussion support and planned presentations to share the outcomes validated the importance of integrating EBP processes and clinical practice. The explicit culture of the NTS academic faculty practice has clearly shifted toward greater appreciation of and willingness for active digestion of literature as a necessary foundation for clinical decision-making.

SELF-INITIATED PRONE PROGRESSION IN INFANTS WITH MOTOR DISABILITY.

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PURPOSE/HYPOTHESIS: The purpose of this study was to test the use of a self-initiated prone progression crawler (SIPPC) to improve functional independence in children with cerebral palsy and to gather data to develop controller algorithms for a motorized SIPPC.

NUMBER OF SUBJECTS: Ten (10) infants, age 4–22 months, participated in the trial. They were divided into 3

groups based on diagnosis: 3 had cerebral palsy (CP), 3 had Down syndrome (DS), and 4 were typically developing. The typically developing infants were recruited at 4 months and the TIMP was used to determine whether or not the infants were at risk for CP. None of infants were able to crawl.

MATERIALS/METHODS: Infants were observed using the SIPPIC in their homes. The SIPPIC is designed as a mobility aid to assist crawling. It consists of a wheeled platform and has two interdependent drive wheels controlled by an on-board computer that can sense propulsion efforts in any direction. Force sensing resistors (FSR) are embedded on the platform to collect information about the infant's effort to move. The study protocol had 3 successive phases: familiarity with the SIPPIC, practice, and infant-initiated trials. Five minutes was allowed for each infant-initiated trial. The protocol was repeated twice (with one rest period), 2× a week for 8 weeks. Performance data were recorded to a laptop computer attached to the SIPPIC and a camera was used to record the infants' movements.

RESULTS: Collected data included movement direction, speed, and support force from the infants. Movement data (and its derivatives) were correlated with the force data collected from the FSRs. The correlation was poor. Movement direction and speed data showed that in all cases, infants with CP and Down syndrome performed with less amplitude and purpose when compared to the typically developing infants. These results were confirmed by video data. Infants with typical development moved the SIPPIC independently at seven months.

CONCLUSIONS: These preliminary findings are promising. They suggest that: the SIPPIC is safe to use with the infants with CP and DS; the infants require multiple teaching and practice opportunities to learn strategies to move and steer the SIPPIC; a motorized SIPPIC can provide the type of assistance they need; and that despite difficulty in moving the SIPPIC, these infants can tolerate using the device.

CLINICAL RELEVANCE: Mobility is fundamental to independence in children. One of the earliest types of functional mobility that is severely compromised in children with CP is prone locomotion. Because the development of prone locomotion during infancy also promotes integration of other systems, failure to develop prone progression may result in wide-ranging limits to developmental outcomes. The use of the SIPPIC bypasses the mobility constraints experienced by infants at high risk for CP, may help facilitate other domains of development, and is consistent with current theories on brain plasticity in children.

THE INTER- AND INTRA-RATER RELIABILITY OF THE MODIFIED HAMMERSMITH FUNCTIONAL MOTOR SCALE FOR CHILDREN WITH SPINAL MUSCULAR ATROPHY (MHFMS-SMA).

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PURPOSE/HYPOTHESIS: The Hammersmith Functional Motor Scale for Children With Spinal Muscular Atrophy (HFMS-SMA) was modified to establish a standard measure of functional ability in children with spinal muscular atrophy type 2 (SMA-2) in a longitudinal multi-center clinical trial. This study assessed the inter- and intrarater reliability of the modified scale (MHFMS-SMA).

NUMBER OF SUBJECTS: Intrarater reliability (in person)- A volunteer sample of 13 children with SMA-2 (range 2.2–9.7 years) was assessed by 2 clinical evaluators. Inter- and intrarater scorer reliability (of videos)- Fourteen children with SMA-2 (range 2 to 12 years), randomly selected from a larger cohort participating in a pilot multi-site clinical trial, were assessed by 4 clinical evaluators at 4 clinical sites.

MATERIALS/METHODS: Multi-disciplinary team meetings were held to minimize potential ambiguities of definition and standardize procedures. Testing of reliability with a repeated measures design was conducted in a multi-institutional setting. Live reliability: Intrarater reliability of the MHFMS-SMA was tested by comparing day 1 and day 2 test results on the MHFMS-SMA. One evaluator tested 7 subjects, the other tested 6. Evaluators were blinded to results. The order of testing was randomized each day. Video reliability: Over a 2 year period a total of 44 children at two sites were assessed using the MHFMS-SMA. All assessments were videotaped. Inter- and intrarater reliability was assessed by review of 14 randomly selected videos by 4 blinded evaluators. Each evaluator initially scored all 14 videos and 8–12 weeks later rescored those same videos.

RESULTS: There were 26 total assessments completed by two evaluators. The average MHFMS-SMA score was 18.7 with a median of 17.5. The scores were normally distributed with a minimum of 3 and a maximum of 40. The reliability coefficient between first and second evaluations was 0.98. Interrater reliability- There were 14 video assessments scored by 4 raters. The intraclass correlation coefficient demonstrated interrater reliability of 0.953 at a 95% confidence interval (0.913, 0.982).

CONCLUSIONS: Intrarater reliability of the MHFMS-SMA in live patients, and interrater reliability of videotaped MHFMS-SMA sessions, are very high. Findings suggest that the MHFMS-SMA is a useful instrument for use in multi-site collaborative treatment trials of children with type SMA-2 between 2 and 12 years of age.

CLINICAL RELEVANCE: Treatment trials for spinal muscular atrophy are currently underway. Critical to the success of any treatment trial is established reliability and ease of use of the trials' functional outcome measure. The original HFMS-SMA demonstrated reliability within a single institution setting; however design ambiguities precluded effective and standardized use in a multi-center trial. The

modified scale (MHFMS-SMA) demonstrated reliability and ease of administration within a multi-institutional setting after clarification of operational definitions and standardization of procedures.

RELATIONSHIP BETWEEN OUTCOME MEASURES ASSESSING STRENGTH AND FUNCTION IN CHILDREN WITH SPINAL MUSCULAR ATROPHY TYPE II AND III.

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PURPOSE/HYPOTHESIS: Both hand-held myometry and the Modified-Hammersmith functional motor scale for children with spinal muscular atrophy (MHFMS-SMA) have shown reliability in assessment of motor change in children with spinal muscular atrophy (SMA), however the relationship between strength and function remains controversial. This study examined the correlation between strength (hand-held myometry) and function (MHFMS-SMA).

NUMBER OF SUBJECTS: Eleven subjects 5 years of age or older with SMA type II and III participated in this study.

MATERIALS/METHODS: All participants were assessed twice during a 1 month pretrial baseline period. Hand-held myometry to assess strength of the bilateral elbow flexors and bilateral knee extensors was completed (3 trials of each muscle) using a hand-held myometer (Lafayette Instruments MMT System Model 01163) at each visit. The MHFMS-SMA was also completed at each visit. Baseline 1 and 2 scores for all measures were assessed for reliability using linear regression and then the correlation between the total myometry score and the MHFMS-SMA score was determined using the Pearson product moment correlation. Myometry scores from the 3 trials for each muscle group were averaged.

RESULTS: Reliability of each individual muscle group was high ranging from 0.91 to 0.96 and the total myometry score also showed excellent reliability at 0.98. MHFMS-SMA scores were reliable from visit 1 to visit 2 with an r^2 value of 0.99. A moderate correlation was demonstrated between the total averaged myometry score and the MHFMS-SMA score with an $r = 0.52$, however this correlation was not clinically significant ($P = 0.057$).

CONCLUSIONS: Excellent reliability of both an impairment level (myometry/strength) and a functional level test (MHFMS-SMA/gross motor) are demonstrated. The lack of clinical significance and only moderate correlation between the 2 measures may be secondary to a small study population and further study should be done to determine if this correlation is more meaningful in a larger population.

CLINICAL RELEVANCE: Clinical trials for SMA are underway and currently utilize both strength and functional outcome measures. The reliability of both has been established. Although the demonstrated correlation between the 2 measures was moderate, a larger population should be examined to ascertain the clinical significance of this correlation.

COORDINATION OF ARM MOVEMENTS IN HEALTHY FULL TERM INFANTS FROM PREREACHING TO THE ONSET OF REACHING.

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PURPOSE/HYPOTHESIS: Principal Component Analysis (PCA) has been used to describe 3D coordination patterns in adult movements including reaching; however, little is known about the 3D coordination in arm movements of infants before and during the onset of reaching. The purpose of this project was to use PCA to quantify longitudinal changes in coordination of prereaching and reaching arm movements in typically developing infants. **NUMBER OF SUBJECTS:** Eighteen healthy full term infants were observed every other week from 8 weeks old to reaching onset.

MATERIALS/METHODS: A high-speed motion capture system recorded the hand and joints motions of infants during 2 conditions: Toy and No-Toy. In the Toy condition infants were seated and allowed free motion of the arms, and shown a midline toy. In the No-Toy condition the setup was identical, but without a toy. Spatial characteristic such as hand position and joint excursions as well as speed characteristic for the hand and joints were calculated.

RESULTS: Interrelationships among hand, joints and the whole arm, a reflection of coordination patterns, were identified by PCA across 3 phases: Early (10 to 8 weeks before reaching onset), Mid (6 to 4 weeks before reaching onset), and Late phases (2 weeks before to the week of reaching onset). For both spatial and speed characteristics, the proximal and distal joints showed opposite changes of interrelationships with the whole arm and other arm segments between No-Toy and Toy conditions, but in a different way. Starting from the Mid phase, toy-oriented changes of the interrelationship was observed in joints but not in hand for both spatial and speed characteristics. During the Late phase, the hand started to show toy-oriented changes for speed but not for spatial characteristics.

CONCLUSIONS: Our results suggested three major conclusions. First, both proximal and distal joints showed toy-oriented changes of the interrelationship in spatial and speed characteristics. This means that at early ages, infants change coordination of their arm in response to being shown a toy. Second, proximal and distal joints displayed different development trajectories in terms of the interrelationship. As such, infants may learn to control their proximal and distal joints differently. Lastly, interrelationships among the hand, joints and the whole arm in spatial characteristics were differed from those in speed characteristics,

suggesting that infants may use different coordination strategies for spatial and speed characteristics and speed characteristics may be more complicated.

CLINICAL RELEVANCE: Our results suggest that 3D analysis of arm movements in young infants may complement clinical assessment in providing information about early arm control. In addition, early arm movements may be useful in identifying coordination impairment for infants at risk such as infants born preterm or with Erb's palsy. Specifically, the Mid phase is a time of important developmental changes. As such early identification of coordination impairment in reaching may be observed as early as 6 to 4 weeks before a reaching delay.

THE PERCEPTIONS OF PHYSICAL THERAPISTS TOWARD THEIR RELATIONSHIPS WITH TEACHERS IN THE MAINSTREAM ENVIRONMENT.

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PURPOSE/HYPOTHESIS: The purpose of this study was to examine the perceptions of physical therapists toward the relationships that exist between teachers and physical therapists within the mainstream educational environment.

NUMBER OF SUBJECTS: Ninety-nine licensed physical therapists (95 female, 5 male), currently employed to provide consulting, direct, or indirect physical therapy (PT) services within Massachusetts' public school systems participated in this study.

MATERIALS/METHODS: The researcher developed survey tool contained three sections including demographic, Likert-style, and open-ended questions. Following expert input for survey development and content validation, the surveys were sent to randomly selected Massachusetts public school districts ($n = 180$) through the special education director for dissemination to physical therapists working in the school district. An incentive was enclosed with each survey and a second mailing was sent to non-respondents to improve the survey response rate. Demographic and Likert-style responses were analyzed with descriptive statistics while open-ended questions were examined through qualitative analysis.

RESULTS: Respondents consisted of 95 female (96%) and 4 male (4%) physical therapists and were representative of 79 districts under the direction of the original 180 superintendents first contacted (44% response rate). The majority of respondents agreed or strongly agreed that: physical therapists and teachers work well together to best benefit the child with disabilities; physical therapists and teachers set common goals for the child with disabilities; teachers and other faculty frequently approach physical therapists for consultation; teachers understand the reasons for pulling a child out of the classroom for PT services, and teachers and other faculty members value

the PT services that are provided within the school setting. The common themes identified through qualitative analysis of the open-ended question responses supported the quantitative findings reported.

CONCLUSIONS: Respondents perceive relationships between physical therapists and teachers working in the mainstream educational environment as positive and beneficial to children with special needs. The results of this study suggest that with work and effort on the part of both teachers and physical therapists, strong working relationships can be developed. This will allow children with special needs to participate in age appropriate activities, facilitate peer-interaction, and foster their ability to learn. This study provided further insight into the challenges that physical therapists are faced with when working with a child with special needs.

CLINICAL RELEVANCE: Physical therapists working in the mainstream educational environment can build on positive working relationships to meet the needs of children who receive PT as part of their school day. Communication with teachers and parents, as well as positive working relationships between professionals within the school setting impact the service providers and the students with special needs.

RELIABILITY OF GAIT AND BALANCE MEASURES IN CHILDREN WITH SPASTIC CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: The purpose of this study was to establish the intersession reliability of temporal-spatial gait parameters obtained utilizing the GAITRite electronic walkway and to establish intersession intrarater reliability for administration of the Pediatric Balance Scale (PBS), and Dimensions D (standing) and E (walking, running and jumping) of the Gross Motor Function Measure (GMFM) in children with spastic cerebral palsy.

NUMBER OF SUBJECTS: Ten children, 7 female and 3 male, 5–15 years of age with a diagnosis of spastic cerebral palsy.

MATERIALS/METHODS: Each child was tested using the GAITRite, PBS and Dimensions D and E of the GMFM on two different days within a two-week period. On the initial day of testing, each child participated in a random card draw to determine the order in which the measures were performed. The random card draw performed at the initial test session determined the order of measure performance throughout both test sessions.

RESULTS: Intraclass Correlation Coefficient (ICC) 2,1 values were obtained to determine the intersession reliability of temporal-spatial gait parameters obtained utilizing the GAITRite. The mean values for three gait trials performed at each of the two test sessions were utilized in the reliability analysis of the gait parameters. ICC 2,1 values were also obtained to determine the intersession

intrarater reliability for the PBS total score and dimension scores for Dimensions D and E of the GMFM. The ICC value obtained for the temporal gait parameter of cadence was excellent with a value of 0.85. ICCs were also calculated for the stance and swing times as percent of the gait cycle for each parameter and were determined to be excellent with values as follows: left stance (0.95), right stance (0.95), left swing time (0.96) and right swing time (0.90). ICCs for the spatial parameters of step length, stride length and heel-to-heel base of support (BOS) were all excellent with values as follows: left step length (0.97), right step length (0.97), left stride length (0.97), right stride length (0.97), left BOS (0.94) and right BOS (0.97). Intrarater reliability for administration of the PBS and Dimensions D and E of the GMFM as determined by the ICCs was also excellent with values of 0.99 for the PBS, 0.97 for Dimension D of the GMFM and 0.99 for Dimension E of the GMFM.

CONCLUSIONS: Gait parameters obtained utilizing the GAITRite were shown to be reliable in a group of children with spastic cerebral palsy. The primary author was also found to be reliable in administration of the PBS and Dimensions D and E of the GMFM to children with spastic cerebral palsy.

CLINICAL RELEVANCE: The GAITRite, PBS and GMFM are measures commonly used by clinicians to assess gait and balance in children with cerebral palsy. Reliability data obtained from this study provides a basis for future studies which will utilize the same measures to assess gait and balance before and after a physical therapy intervention in children with spastic cerebral palsy.

GROUND REACTION FORCES IN BOYS WHO ARE OVERWEIGHT VERSUS HEALTHY WEIGHT DURING WALKING AND SIT TO STAND.

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PURPOSE/HYPOTHESIS: Obesity is currently the most common chronic medical problem in children in the U.S. today, with approximately 50% of children either overweight or at risk for becoming overweight. These children are at greater risk for developing chronic medical conditions such as diabetes, hypertension, and musculoskeletal problems. Little attention has been paid to the musculoskeletal implications of increasing active movement in children who are overweight. The purpose of this study was to investigate the ground reaction force differences in boys who are overweight versus boys of healthy weight during walking and sit to stand [STS].

NUMBER OF SUBJECTS: Five subjects considered healthy weight (HW, BMI 5–75% for age/gender); three subjects considered overweight or at risk for overweight (OW, BMI >85% for age/gender). Subjects were all males, 10–12 years old.

MATERIALS/METHODS: Kinetic data were collected at 960 Hz using an AMTI force platform as subjects walked at self-selected speed and stood up from a bench (standardized to lower leg length). Ten trials of each task were performed. Peak ground reaction forces (GRF, normalized to subject's body weight) were analyzed in all three planes (vertical, anterior-posterior [AP] and medial-lateral [ML]). The difference in amplitude between the two vertical GRF peaks during walking was also calculated. Comparisons between group mean values for each task were performed using Student's *t* test (alpha level = 0.05).

RESULTS: Significant differences were found between groups for peak AP GRF during STS (HW group mean = $-.097$ BW [SD = 0.045]; OW group mean = $-.051$ BW [SD = 0.022]; $P = 0.05$), and for the difference between vertical GRF peaks during walking (HW group mean = 0.192 BW [SD = 0.105]; OW group mean = 0.073 BW [SD = 0.058]; $P = 0.04$). Subjects who were overweight produced less AP force during STS, possibly due to an inability to lean forward during this task, given the girth of their lower trunk and thighs. During walking, the difference between vertical GRF peaks was less in the OW group, suggesting that less of the initial impact was absorbed in the vertical direction. Subjects who are overweight may redistribute GRFs in the ML direction during walking and STS, which would increase frontal plane stresses in the ankle, knee and hip. Further investigation is planned to determine lower extremity joint moments and powers during these movements.

CONCLUSIONS: Subjects who were overweight exhibited differences in GRFs during STS and walking, suggesting alterations in movements which may increase the risk of developing musculoskeletal pain and dysfunction especially in the lower extremities.

CLINICAL RELEVANCE: To lessen the potential risk of musculoskeletal pain and dysfunction, pediatric PTs need to provide input to the assessment and treatment of children who are overweight as these children increase their activity to achieve a healthy weight.

AN AFTERSCHOOL HEALTH AND NUTRITION PROGRAM'S EFFECT ON ELECTRONIC MEDIA AND CHILDHOOD OBESITY.

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PURPOSE/HYPOTHESIS: The aim of this research study was to investigate an intervention that could successfully decrease electronic media usage and sedentary activity and therefore positively affect the problem of childhood obesity.

NUMBER OF SUBJECTS: Twenty-one 8–10 year old children from two local elementary schools completed the intervention.

MATERIALS/METHODS: The study design consisted of an eight week intervention conducted by the University of Nevada, Las Vegas departments of Nutrition and Physical Therapy, which incorporated nutrition education and promoted physical activity. Data was collected through a written questionnaire and a fitness assessment. The questionnaire assessed daily eating habits and electronic media usage, while the fitness testing assessed percent body fat, BMI, strength, and flexibility.

RESULTS: Boys demonstrated a significant increase in grip strength ($P = 0.007$), but showed no changes in the other variables. Electronic media viewing demonstrated no significant decreases after intervention. Girls demonstrated no significant changes in all variables measured. Percent body fat and electronic media viewing time approached significance for decreasing ($P = 0.113$ and 0.075 respectively). When analyzed as a group, children were able to do more curl-ups ($P = 0.049$). In addition, there was a trend toward decreasing the number of hours of television viewing on weekdays ($P = 0.091$). Linear regression indicated that percent body fat, gender, and hours/day of video game play during the week contributed to the prediction of BMI, $F(3,16) = 20.224$, $P < 0.0005$. These three variables accounted for 79.1% of the variance of BMI, $R^2 = 0.791$.

CONCLUSIONS: Based upon the results of this study and the findings of other studies, the current methodology used in the WE CAN! intervention program seems inadequate to counteract electronic media and its influence on childhood obesity. Children should be motivated to decrease sedentary activity and increase physical activity. Increased parental involvement and support from educators could lead to significant improvements in the success of interventions such as the one used here.

CLINICAL RELEVANCE: As childhood obesity remains a growing problem in the United States and around the world, an affective intervention is necessary to promote health in children. Physical therapists should look into ways of promoting health and fitness in this area of the population. This research demonstrates that the issue of obesity in children remains a complex problem that requires further investigation.

A PILOT STUDY OF THE EFFECT OF A FITNESS CLASS ON ADOLESCENTS WITH CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: The purpose of this pilot study was to examine the effect of a combined aerobic and

strength training fitness program on adolescents with cerebral palsy (CP). We hypothesized that, following an 8 week fitness program, adolescents with cerebral palsy would demonstrate improved motor function and psychological state.

NUMBER OF SUBJECTS: The sample included 5 adolescent subjects ($M = 2$, $F = 3$, mean age = 15.00 ± 3.16 y) with CP (GMFCS: I = 3, II = 1, III = 1).

MATERIALS/METHODS: All subjects participated in a tailored group fitness program held in an outpatient pediatric physical therapy clinic. The program met for 90 minutes two times per week for eight weeks. Subjects participated in weight training, cardiovascular exercises, stretching, balance, and coordination activities. All subjects completed physical assessments at the beginning and completion of the eight-week program. Outcome measures included Timed Up and Go (TUG), Pediatric Berg Balance Scale, Six Minute Walk Test, and Biodex strength testing. Subjects and/or parents also completed two self-report activity and participation measures: the Pediatric Outcomes Data Collection Instrument (PODCI) and the Children's Assessment of Participation and Enjoyment (CAPE).

RESULTS: Subjects demonstrated significant improvement on the Pediatric Berg Balance Scale ($P < 0.05$) and the PODCI domain of "sports and physical function" ($P < 0.05$). The TUG demonstrated a trend toward improvement ($P = 0.11$) when all five subjects were analyzed. The trend towards improvement for the TUG was greater when only the four subjects with age appropriate cognition were included for analysis ($P = 0.06$). Improvement was also noted individually on the Six Minute Walk Test, Biodex strength testing, other domains of the PODCI, and the CAPE but no group conclusions could be drawn. The inability to obtain significance with the current sample was likely due to small sample size.

CONCLUSIONS: The adolescent subjects with CP who participated in a tailored fitness program demonstrated improved motor function with the Pediatric Berg Balance Scale and improved psychological state on the PODCI domain of "sports and physical function."

CLINICAL RELEVANCE: These preliminary findings are important because they suggest participation in a tailored fitness program will improve motor function and psychological state in adolescents with CP. The activities utilized in this pilot study included weight training, cardiovascular exercises, stretching, balance, and coordination activities. They are commonly used in an outpatient orthopedic setting, implying that the implementation of fitness programs is possible with equipment readily available to clinicians.

THE RELATIONSHIP BETWEEN DYNAMIC STANDING BALANCE AND GAIT IN CHILDREN WITH AND WITHOUT CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: The focus of physical therapy for children with developmental disabilities has been the attainment of independent ambulation, with interventions focused on the improvement of balance and postural control. Previous reports that balance does not correlate with walking ability argue against this approach. However, these reports used measures of static balance ability, which does not reflect the dynamic nature of control required for walking. The primary objective of this investigation was to determine if a relationship exists between dynamic balance and walking ability (functional level, and gait parameters) in children with and without cerebral palsy (CP). This information is important for the development of appropriate interventions to improve walking ability.

NUMBER OF SUBJECTS: Twelve subjects participated: three “typically” developing children (mean age = 4.67; Group 0) and nine children diagnosed with CP, spastic diplegia. Those with CP were grouped by walking ability using the Gross Motor Classification System (GMFCS): GMFCS 1 ($n = 2$, mean age = 7.5), GMFCS 2 ($n = 5$, mean age = 8.4) and GMFCS 3 ($n = 2$, mean age = 13). Informed consent and assent was obtained for all subjects.

MATERIALS/METHODS: To measure dynamic balance, concurrent measures of center of pressure excursion (COPE) and forward excursion at the shoulder and pelvis were obtained as the subject leaned forward with arms uncrossed (extended forward level with the shoulders) while standing on a forceplate for two trials. The validity and reliability of this technique was previously reported. Temporal gait measures were obtained using videoanalysis. Subjects were videotaped as they walked at a self determined pace across a 10 meter walkway for three trials.

RESULTS: Shoulder excursion was moderately correlated with cadence ($r = 0.619$, $P = 0.042$) and step width ($r = -.785$, $P = 0.004$). A moderate to strong correlation was found between COPE and gait velocity ($r = 0.636$, $P = 0.048$), cadence ($r = 0.720$, $P = 0.019$) and step width ($r = -.647$, $P = 0.043$). Step width ($P = 0.021$), velocity ($P = 0.07$), and excursion of COP ($P = 0.048$) and at the shoulder ($P = 0.004$) differed between groups.

CONCLUSIONS: Dynamic balance can be measured using sophisticated (*i.e.* COPE) and clinical (*i.e.* forward lean) measures. These measures differed between groups, and correlated with gait velocity, cadence, and step width. The results support the relationship between dynamic balance and measures of gait and walking ability.

CLINICAL RELEVANCE: Intuitively therapists have assumed a relationship exists between dynamic balance and walking ability. The findings that dynamic balance measures correlate with temporal gait parameters and differ with varying levels of walking ability as measured by the GMFCS suggest that interventions that promote dynamic balance will result in improved walking ability. Future investigations are needed to establish normative

values and to determine optimal interventions to improve dynamic balance and walking ability.

PHYSICAL THERAPISTS AND THE EARLY INTERVENTION NETWORK OF NEW HAMPSHIRE (EIN) MENTORSHIP PROGRAM.

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PURPOSE: Mentorship has long been known and understood to be an excellent method to assist people in learning how to achieve a higher level of skill in a chosen area by engaging in close contact with an expert in the field they wish to pursue. The APTA openly endorses mentorship and has developed and sponsored the “Members Mentoring Members” program for the past several years. In the state of New Hampshire (NH), early childhood workers (including physical therapists) have also recognized the value of mentorship and have established a mentorship program which has run successfully for the last 9 years. This poster will describe this valuable NH resource as well as strive to encourage other states to develop similar mentorship programs.

DESCRIPTION: The goal of ein’s Mentorship Program is “to improve outcomes for infants, toddlers, and preschool-aged children with disabilities and their families through provision of a statewide, high quality, intensive mentorship program.” The mentorship program is funded by the NH Department of Health and Human Services, Division of Developmental Services, and the NH Department of Education Bureau of Special Education. Mentorship opportunities are divided into 1:1 mentor/mentee learning and mentor/small group topical mentorship workshops. 1:1 dyads schedule 10–15 hours of time to work together on mutually agreed upon predetermined goals. In the topical mentorship option, the mentor instructs a small group of mentees in a topic area of interest, followed by 1:1 time with each mentee individually. Both mentor and mentee are required to provide formal feedback on the effectiveness of the experience. Mentees are encouraged to return to their perspective worksite to disseminate their acquired knowledge and skills to coworkers. Mentors are compensated at a rate of \$50.00/hr. for 1:1 mentoring and \$100.00/hr. for topical mentorship.

SUMMARY OF USE: Hundreds of early childhood professionals have participated in the NH ein Mentorship Program over the last 9 years. Out of these, 24 were PTs. Mentors and mentees have also included occupational therapists, speech therapists, early childhood educators, childcare providers, and administrators. Mentorship dyads have been both interdisciplinary and transdisciplinary. Mentorship topics that PT’s have been involved in have included prematurity, NICU treatment, hand splinting, general pediatric interventions, team communication, motor and infant assessment, social development,

oral-motor/feeding, occupational therapy techniques, club feet, vision issues, and positioning. Feedback has been very positive.

IMPORTANCE TO MEMBERS: Physical therapists in NH would benefit from participation in the eein Mentorship Program as either a mentor or mentee; both gaining professional and personal growth. The NH eein Mentorship Program can also serve as model to other states as they strive to find ways to improve services to young children and families in their states.

THE PREVALENCE AND MANAGEMENT OF LOWER EXTREMITY CONTRACTURES IN CHILDREN WITH CEREBRAL PALSY: A SURVEY OF VERMONT PEDIATRIC PHYSICAL THERAPISTS.

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PURPOSE/HYPOTHESIS: Contractures are common in children with cerebral palsy (CP) and many interventions are used to prevent and treat this impairment. Descriptions of the prevalence and treatment of contractures, however, are limited. The purposes of the study were to survey Vermont pediatric physical therapists: 1) to estimate the prevalence of lower extremity contractures in children with CP and 2) to identify interventions used to prevent and manage contractures.

NUMBER OF SUBJECTS: Participants were 32 self-identified Vermont pediatric physical therapists (response rate = 41%) who were actively treating 183 children with CP. All participants were women, the mean age was 44 years, and mean number of years in practice was 20 years.

MATERIALS/METHODS: A 15 item survey instrument was developed by three pediatric physical therapists and included questions about lower extremity contractures and physical therapy and medical interventions used to manage this condition in the past 3 months. The survey was mailed to 79 physical therapists (41% response rate) using a statewide database of self-identified pediatric practitioners.

RESULTS: According to 2000 US Census Bureau information, there are 166,257 children in Vermont under 20 years of age. Assuming a prevalence of 2 per 1000, it is estimated that 333 children in Vermont have CP. Contracture prevalence and treatment information was obtained for 183 children with CP which represents 55% of the pediatric population in the state expected to have this diagnosis. The estimated prevalence of flexible contractures was 36%, 33%, and 35% for the hip, knee, and ankle joints, respectively. Prevalence of fixed contractures was 26%, 24%, and 33% for the hip, knee and ankle joints, respectively. Botulinum-toxin injections (25%)

and oral anti-spasticity medications (16%) were the most commonly used medical treatments to prevent and manage contractures. Physical therapy interventions included stretching (92%), play (92%), gait training (86%), strength training (86%), orthotic devices (77%), and adaptive equipment (74%).

CONCLUSIONS: Lower extremity contractures were prevalent in Vermont children with CP and many interventions were used to prevent and manage this impairment.

CLINICAL RELEVANCE: This study provides general information about the prevalence and management of contractures in children with CP. Variations in treatment associated with the type of contracture, the child's age, severity of disability, and other factors should be explored. Studies of the frequency, intensity, and efficacy of PT interventions are needed.

LOCOMOTOR TRAINING AFTER A SEVERE INCOMPLETE SPINAL CORD INJURY IN A YOUNG CHILD — A CASE REPORT.

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BACKGROUND & PURPOSE: Extensive spinal cord injury (SCI) rehabilitation research over the past decade has provided physical therapists with guidelines for locomotor training with patients following incomplete SCI. Significant improvements in function have been reported after partial body weight suspension and treadmill gait training in adults with various levels of injury, severity, and time since injury. Locomotor training takes advantage of existing neural pathways and drives plastic changes that increase connectivity between spinal and supraspinal neurons. However, evidence suggests that central motor pathways are not mature until adolescence. Children with immature neural pathways may not experience improvements similar to those reported in adults. This report describes a locomotor training program with a young child with a severe incomplete SCI.

CASE DESCRIPTION: Patient: The patient was a 5-year-old female who sustained a spinal cord contusion and was transferred to a pediatric inpatient rehabilitation facility with a halo 5 days after injury with a diagnosis of SCI C4, ASIA A.

EXAMINATION: Initial ASIA Upper Extremity Motor Score (UEMS) was 1/50 and Lower Extremity Motor Score (LEMS) was 0/50. She was dependent for all mobility and self-care.

INTERVENTION: The patient received physical therapy for 8–9 hours each week within a multidisciplinary inpatient rehabilitation program. Locomotor training was initiated 1 month after injury and was included within daily physical therapy sessions. At this time, she had an ASIA C classification, UEMS of 8/50 and LEMS of 4/50. Her WISCI II score was 0. Body weight supported training

was performed 3–4 times per week for 5 months. Overground training began 10 weeks after injury, when the patient could independently step with her right leg with weight support on the treadmill.

OUTCOMES: Walking speed began at 0.27 m/s on the treadmill and gradually increased to 1.12 m/s. The patient's UEMS increased from 8/50 at the initiation of locomotor training to 31/50 and her LEMS increased from 4/50 to 29/50. WeeFIM mobility score increased from 5/35 to 21/35 and from 8/54 to 34/54 in the Self-Care domain. WISCI II score improved from 0 to 12. The patient returned to school, church, and community activities walking with assistive devices.

DISCUSSION: These outcomes are consistent with results in adults. Locomotor training may be effective in children with immature central motor pathways. It is possible that the neural locomotor circuits are well established in a child of this age. More advanced motor skills that are refined after this age may require continued maturation of the corticospinal and other motor tracts. This report also verifies the feasibility of implementing an intensive locomotor program in the clinical rehabilitation setting with a patient with severe motor impairment. Further investigation with clinical trials will determine the extent to which this training may benefit a larger pediatric population with SCI.

EFFECTS OF SMALLER AND LARGER OBSTACLES ON GAIT PARAMETERS OF ADULTS WITH AND WITHOUT DOWN SYNDROME.

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PURPOSE/HYPOTHESIS: Persons with Down syndrome (DS) are now living well into adulthood. The median age at death has increased from 25 years in 1983 to 49 years in 1997 (Yang, Rasmussen, & Friedman, 2002/3/23). Subsequently, premature aging has been noted in this population; the rate of primary aging is nearly twice that of adults with typical development (TD) (Nakamura & Tanaka, 1998). In the population with TD, age related changes in gait include reduced stride length and reduced velocity and are observed starting around 64 years of age (Stolze, Friedrich, Steinauer, & Vieregge, 2000 Apr-Jun) (Samson et al., 2001 Feb). Although normalized step width is larger in preadolescents with DS than in those with TD, these groups do not differ on normalized velocity and stride length (Ulrich, Haehl, Buzzi, Kubo, & Holt, 2004 Sep). Our aim is to explore the gait patterns of adults with DS for precocious age-related changes during both comfortable overground walking and in more challenging obstacle conditions.

NUMBER OF SUBJECTS: 7 adults with DS and 10 adults with TD between the ages of 35 and 62 years participated. We selected adults with TD to match the height and weight of participants with DS.

MATERIALS/METHODS: Participants walked barefoot at their preferred speed over a 5.3-meter GAITRite mat (overground condition). We then asked them to step over a 14 cm circumference foam-covered rod positioned 12 cm above the mat (pipe condition). Next, participants ascended and descended one standard 20 cm high step, first placing two feet on top of the step (2-foot condition) and then only one foot (1-foot condition). For all obstacle conditions participants were instructed to walk to the opposite end of the mat at their comfortable speed and to step onto or over obstacles as they preferred. We collected GAITRite, video, 3-D joint position, EMG, balance and anthropometric data. We normalized all gait variables to leg length. Here we present only GAITRite derived walking parameters.

RESULTS: During comfortable overground walking, adults with DS walked slower ($P = 0.043$) and took shorter strides ($P = 0.002$) with a wider base of support (BOS) ($P = 0.002$) than their peers with TD. Adults with DS also took shorter strides in all obstacle conditions (2-foot $P = 0.002$, 1-foot $P = 0.032$, pipe $P = 0.002$) and they were slower than the adults with TD in all obstacle conditions except the pipe condition (2-foot $P = 0.019$, 1-foot $P = 0.038$). BOS group variability (standard deviations) increased during the step conditions, and there was not a significant group difference. Participants with DS did, however, demonstrate a wider BOS during the pipe condition ($P = 0.004$).

CONCLUSIONS: Adults with DS demonstrate gait changes consistent with aging at a younger chronological age than adults with TD. Stride length was consistently shorter in adults with DS in all conditions, even when normalized to leg length.

CLINICAL RELEVANCE: The activity of walking, which is important for participation in many activities of daily living, is impaired in adults with DS who demonstrate slower gait velocity, reduced stride length and a wider BOS.

COMPARISON OF CANADIAN AND USA NORMS ON THE HARRIS INFANT NEUROMOTOR TEST.

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PURPOSE/HYPOTHESIS: The purpose of this study was to collect normative data on the newly developed Harris Infant Neuromotor Test (HINT) in the United States (USA), and compare it to normative data previously collected in Canada. The HINT is a quick and easy screening tool used to assess infant neuromotor development. This question is part of a larger study still in progress to determine differences on the HINT between healthy infants

from different ethnic and socioeconomic groups, and to determine the concurrent validity of the HINT and Ages & Stages Questionnaire (ASQ). We hypothesize that there will be no difference between USA and Canadian normative values on the HINT.

NUMBER OF SUBJECTS: Data has been collected on a convenience sample of 31 healthy, typically developing USA infants, from 0–12 months of age to determine if Canadian and USA total scores differ. For comparison, data on 31 Canadian babies was provided by the author of the HINT.

MATERIALS/METHODS: Subjects were recruited in the greater Puget Sound area from healthcare facilities, baby play groups, and by word of mouth. Testing took place either in the infant's home, in our physical therapy clinic, or in other healthcare facilities. Data were collected by three students in the DPT program at the University of Puget Sound. Inter-rater reliability (ICC = 0.715–.984) was established for all raters during pilot testing in comparison to a rater trained and verified as reliable by the HINT author. The HINT author then provided data from Canadian infants that were matched with the data from USA infants for subject age, parental ethnicity, and parental level of education. All data were analyzed using SPSS 13.0. Differences between the USA and Canadian data were analyzed via *t* tests and Chi-Square tests of independence using an alpha <0.05.

RESULTS: There were no significant differences between the USA and Canadian infants with regard to subject age, parental ethnicity, or parental level of education. The HINT total scores between USA and Canadian babies showed no statistically significant difference.

CONCLUSIONS: The hypothesis that HINT scores of USA and Canadian infants are not significantly different was confirmed in this study. A follow up study with a larger subject pool would strengthen these results. Additionally, HINT data for infants with different ethnic backgrounds and socioeconomic status need to be collected and analyzed to determine if previously collected normative data are consistent with these populations as well.

CLINICAL RELEVANCE: Although much HINT data have been collected in Canada, this is the first study collecting data on USA infants. Since the results indicate that HINT scores of USA and Canadian infants are not significantly different, norms developed from previously collected data on infants in Canada should be appropriate to apply in the USA. Further research is in progress to determine if these norms will also be appropriate to use for infants with different ethnic backgrounds and socioeconomic status.

INFLUENCES OF BACKPACKS ON GAIT IN SCHOOL-AGED CHILDREN.

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PURPOSE/HYPOTHESIS: Over 40 million American students carry backpacks that are often overloaded with books. Research shows the risk for musculoskeletal pain increases when carrying heavy backpacks. Yet the impact these weighted backpacks have on walking is relatively unknown. Thus, the aim of this study was to investigate how carrying backpacks influenced gait patterns in healthy, school-aged children.

NUMBER OF SUBJECTS: Thirty-four (18 females and 16 males) children between the ages of 10 and 18 years, and with no known spinal or lower extremity musculoskeletal problems participated.

MATERIALS/METHODS: Subjects walked 24 feet carrying a standard backpack for a total of 40 trials: five trials each under eight testing conditions that varied weight (0, 7.5, and 15 pounds) and carrying style (one or two shoulder straps). Each subject began and ended the single testing session by walking with an empty backpack secured with two straps then one; the four intermediate weight-by-carrying style conditions were randomized. Velocity, cadence, stride length, and double support time were recorded with the GAITRite™ computerized mat. Means from each condition were calculated, and then one-way repeated measures ANOVAs were used to determine within-group differences for each of the dependent variables ($P \leq 0.05$). Paired *t* tests were employed for post hoc analyses.

RESULTS: Despite differences in backpack weights and carrying style, subjects attained comparable walking velocities by using relatively equivalent cadences but significantly different stride lengths ($P = 0.012$). The stride lengths were also influenced by bodyweight ($P = 0.023$) and height ($P = 0.010$). Similarly, when adjusted for bodyweight, velocity ($P = 0.039$) and double support times ($P = 0.027$) differed significantly.

CONCLUSIONS: For healthy older children, minimal gait changes occur when walking with backpacks containing various weights when carried either with one or two shoulder straps. However, our data indicate that bodyweight may influence the ability to manage heavier backpacks during walking events. We recommend that subsequent studies normalize the weights in backpacks to each subject's bodyweight to best determine the influence of backpacks on walking patterns.

CLINICAL RELEVANCE: Understanding the influences that loaded backpacks have on gait parameters will enable physical therapists to help students and their parents make better decisions about modifying this common activity of daily living.

PARENTAL PERSPECTIVES OF MOBILITY IN CHILDREN WITH CEREBRAL PALSY.

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PURPOSE/HYPOTHESIS: The purpose of this qualitative study was to describe mobility decision-making experiences of parents who have children with cerebral palsy (CP). Children with CP and their families have reported that improving mobility was their most important functional goal which is consistent with the focus of physical therapy. Previous research indicates that the usual mobility methods for children with CP differ across home, school and community settings. The reasons for these differences, however, remain unknown.

NUMBER OF SUBJECTS: Five mothers of children with CP, ages 6 to 9 years old, classified into Gross Motor Function Classification System (GMFCS) levels II-IV, participated in in-depth interviews.

MATERIALS/METHODS: A qualitative, phenomenological approach was used to describe the mobility decision-making experiences of mothers who have children with CP. Participants were asked to talk about their child's mobility in home, school, and community settings. Interviews were recorded, transcribed, and analyzed using a seven-level interpretative process. The research team analyzed the interview transcripts by identifying codes (key words), themes (recurring codes found within each interview) and patterns (recurring themes found across all interviews).

RESULTS: Four patterns emerged from the interviews suggesting that the mothers' experiences with mobility decision-making were characterized by: a) balancing act, b) concept of the future, c) assimilation, and d) fear. Mobility decisions included a "balancing act" that consisted of the convenience, efficiency and practicality of mobility methods balanced with family dynamics and the hopes and fears for the future. Mothers expressed concerns regarding "assimilation" with peers and fear for the child's safety, along with doubts about their decision-making.

CONCLUSIONS: Decision-making regarding mobility is a complex process and involves a variety of considerations related to family dynamics, future goals and peer interactions, along with maintaining safety in various environmental settings.

CLINICAL RELEVANCE: The results provide insights about the complex issues faced by families of children with CP with mobility limitations. Understanding these experiences will enable physical therapists to design better interventions to improve mobility for children with CP across a variety of environmental settings.

RELIABILITY AND VALIDITY OF THE TIMED OBSTACLE AMBULATION TEST (TOAT) IN CHILDREN WITH AND WITHOUT MOTOR DISABILITIES (MDS).

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PURPOSE/HYPOTHESIS: Community mobility poses many challenges to children with motor disabilities (MDs). In children with and without MDs, we want to show that a standardized obstacle course, the TOAT, is a valid and reliable measure of community mobility. The TOAT requires the navigation of obstacles that children face daily, such as picking up items off the floor, negotiating curbs, and walking across wood chips. The TOAT provides qualitative and quantitative information regarding the child's mobility that cannot be currently gathered in standardized tests.

NUMBER OF SUBJECTS: Thirteen children without and three children with MDs between four and ten years old were recruited from the Good Samaritan Children's Therapy Unit in Puyallup, WA, and via convenience sampling from the Puget Sound region.

MATERIALS/METHODS: Data collection procedures included videotaping, timing with a stopwatch, interviewing a parent or caregiver regarding their child's daily functioning using the Pediatric Evaluation of Disability Inventory (PEDI), and observing and describing the child's movement. Each child completed several tests including the TOAT, the Standardized Walking Obstacle Course (SWOC), the Pediatric Balance Scale (PBS), and the Timed Up and Go (TUG). Inter-rater and within-session test-retest reliability (TOAT trial 1 [T1] at beginning of testing, and trial 2 [T2] at end of session) of both the time to walk through the TOAT and the quality of balance and coordination at several locations along the course were evaluated. Validity was examined through correlations between the total scores on the TOAT and other tests.

RESULTS: All raters were reliable in the timing of the SWOC (ICC (3,1) = 0.995) and the TUG (ICC (3,1) = 0.985). Timing of the TOAT was also reliable (inter-rater reliability ICC (2,1) = 0.998 T1; test-retest reliability ICC (2,1) = 0.855-0.887). TOAT time was moderately correlated with SWOC time (Pearson $r = 0.674$, $P = 0.004$ T1) and highly correlated with TUG time (Pearson $r = 0.848$, $P = 0.000$ T1). TOAT time correlated moderately with the total PBS score (Spearman $r = -0.724$, $P = 0.002$ T1). Total qualitative scores for TOAT T2 moderately correlated with the SWOC, TUG and PBS ($r = -0.566-0.497$, $P = 0.022-0.050$), however T1 was not. Total qualitative TOAT score and TOAT time for T1 were significantly correlated ($r = -0.639$, $P = 0.008$). The TOAT was not significantly correlated with all sections of the PEDI ($r = 0.235-0.598$, $P = 0.014-0.381$).

CONCLUSIONS: The TOAT is a reliable and valid tool when compared to the SWOC, TUG, and PBS. The lower correlation with the PEDI likely occurred as it is a more descriptive survey and is based on parent report. However, it does not allow for observation of mobility as does the TOAT. More children with MDs need to be tested within the research paradigm.

CLINICAL RELEVANCE: Using the TOAT in a clinical setting could provide clinicians with important information regarding a child's safety and preparedness for ambulating in the community. TOAT outcomes could also be used to develop specific therapeutic activities to improve community mobility.

OUTCOME OF AN 8-WEEK INTENSIVE NMES PROTOCOL FOR A CHILD WITH HEMIPLEGIA.

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PURPOSE/HYPOTHESIS: To examine the outcomes of an intensive NMES protocol using the the framework of the International Classification of Functioning Disability and Health (ICF) and family driven goals.

NUMBER OF SUBJECTS: An 18-month old child with CP, left hemiplegia. The child was classified as Level II on the Gross Motor Classification Function Scale (GMCF5).

MATERIALS/METHODS: We used a pre/post treatment measurement design and assessed the outcome of the intervention at the 3 levels of the ICF. The intervention consisted of 15 minutes of NMES administered 4 times per week for 8 weeks, an ankle foot orthosis, pre-gait exercises, and night braces. The intervention occurred in the child's home. The Home Observation for Measurement of the Environment (HOME) and the Pediatric Evaluation of Disability Inventory (PEDI) were used to assess the child's participation. The Gross Motor Function Measure-88 (GMFM-88) was used to measure gross motor performance (activity level) and the Modified Ashworth Scale (MAS) and goniometry were used to assess impairments in body structure and function. Family selected goals served as an additional outcome measure for the participation and activity levels of the ICF.

RESULTS: The child's PEDI scaled scores on self-care increased from 28 to 33, mobility from 29 to 34.7, and social function from 34 to 42.5 following an 8 week intervention. On the caregiver assistance scale, self-care scores increased from 11.6 to 20.1, mobility scores from 11.7 to 20.3 and social function scores from 20.4 to 26.6. The Home scores increased from 43 to 45.

The GMFM total and goal area scores also increased from 28% to 40.5% and 4% to 27.6%, respectively. The change score of 12.5% exceeded the 4.12% expected for a child of less than 2 years old, with level II GMCF5 cerebral palsy. Improvement was also observed in family goals (80%) and range of motion, but not spasticity.

CONCLUSIONS: The magnitude of the change suggests the NMES protocol effectively improved the child's performance in areas that reflect the participation and activity levels (ICF) as measured by the PEDI and GMFM 88. However, the magnitude of change was modest in that the PEDI change scores did not meet the criteria for minimally significant clinical change. The changes at the level of the body structure and function measured by the MAS and goniometry, were inconsistent, with no changes observed in the degree of spasticity that the child exhibited. The intervention was successful in meeting most of the family goals. These findings suggest the need for a larger study on intensive NMES protocols.

CLINICAL RELEVANCE: In the past physical therapists have maintained that the outcomes of physical therapy are wide-ranging, but these were not well documented. Recent availability of reliable and valid tools of motor function and the revised ICF have made it possible to assess these outcomes at various levels of function. The findings here suggest that the use of the ICF along with multiple measuring tools and family driven goals provide an avenue that therapists can use to examine the effects of their interventions.