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ABSTRACT

The purpose of this study is to determine the concurrent validity of the Timed Up and Go (TUG) as an assessment of functional mobility in the pediatric population. The TUG scores were correlated with the Pediatric Evaluation of Disability Inventory (PEDI). Eighteen subjects with a variety of cognitive and physical disabilities, aged 6 to 7 years, were recruited. A one-tailed Spearman's Rank Correlation Coefficient was used to analyze the scores. A weak inverse relationship between the TUG and PEDI scores ($r_s = -0.386$, $p = 0.075$) was found when the scores from all participants were analyzed. A moderate inverse relationship was shown when the physically challenged individual scores were run separately ($r_s = -0.523$, $p = 0.027$). Generalizations cannot be made regarding the use of the TUG with the pediatric population due to the small sample size of this study. Further research is necessary to investigate the validity of using the TUG to measure functional mobility in the pediatric population.

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

CHAPTER ONE
INTRODUCTION

Background to Problem

Today in pediatric rehabilitation, there is a major focus on functional outcome measures and functional assessments. Haley, Coster, and Ludlow (1991, p. 691) believe a functional outcome measure is able to evaluate "any restriction or lack of ability to perform an everyday activity in a manner or within the range considered normal for the person of the same age, culture and education." For a child to be functional, the child must be independent and safe in age appropriate activities. Thompson and Medley (1995) suggest a need for quick, easy, and reliable functional outcome measures to determine the individual's ability to interact in the community.

A functional assessment needs to be sensitive enough to appraise the participant in the performance of everyday activities within the assessment environment. Haley, Coster, and Faas (1991, p. 177) state a ". . . functional assessment is concerned with the child's performance in relation to physical and social demands, most pediatric and adult functional tests emphasize accomplishment of specific daily activities." Fleming, Evans, Weber, and Chutka (1995) believe that activities of daily living (ADLs) in the adult population should include the ability to provide self-care and mobility functions. For a school-age child this would include: transitions from one activity to another, walking to and from class, getting around the home, providing self care, and being involved in school and play activities (Haley, Coster, Ludlow, Haltiwanger, Andrellos, 1992).

In their review of principles and methods for assessing functional abilities in children, Haley, Coster, and Ludlow, (1991, p. 689) stated, "Leaders in many disciplines involved in pediatric rehabilitation have stressed the importance of functional outcome measures in clinical practice." Historically, pediatric evaluation measures focused on developmental milestones in the assessment of children with disabilities. Functional outcome measures emphasize the importance of independent participation and completion of daily activities rather than the ability of a child to perform jumping, hopping, or single limb stance routines (developmental milestones).

In the past, mobility has been measured by traditional neuromuscular examinations. These methods were useful in establishing a diagnosis, but did not indicate the functional abilities of the individual. Testing of balance and gait on force platforms or treadmills is impractical and time consuming for everyday use in the clinic (Podsiadlo and Richardson, 1991). Lowes (1996) believes that functional ability is what determines the child's ability to learn, play, and participate in daily activities. Lowes (1996) states that gross motor skill assessments better reflect the child's functional abilities than assessments made at the impairment level. Lowes (1996) states that adequate balance is a necessary component to perform gross motor skills, and this in turn allows a child to perform functional tasks. Lowes (1996) believes that pediatric assessment tools used to evaluate gross motor skills or functional abilities can also be considered an indirect indication of the child's ability to balance.

Haley, Coster, and Faas (1991) suggest that there is a lack of standardized tools to measure the functional status of children for use by therapists to plan, monitor, and document treatment progress. Feldmen, Haley, and Coryell (1990, p. 603) state "despite the agreement that functional assessments for infants and young children are valuable, few standardized instruments have been developed for this age group." For functional assessment tools to be useful, the tool must be shown to be valid and reliable.

Problem Statement

The pediatric physical therapist needs assessments that are objective, valid, reliable, functional, and easy to administer. There is a limited number of such functional assessments available for pediatric therapists that fit the above criteria. Many of the assessments for the adult population that are objective, functional, and easy to administer have not yet been shown to be valid and reliable with children.

Purpose

The purpose of this study is to determine the concurrent validity of the "Timed Up and Go" (TUG) by correlating the TUG with the Pediatric Evaluation of Disability Inventory (PEDI) mobility domain. If concurrent validity is found then there will be evidence that the TUG is a valid assessment tool of functional mobility in the pediatric population. The PEDI has been shown to be a valid and reliable functional assessment for use in the pediatric population (Feldman, Haley, and Coryell, 1990; Reid, Boschen, and Wright, 1993).

Significance of the Problem

The TUG is a quick, easy, and objective measure of functional mobility, which has also been shown to be valid and reliable for use in the frail elderly population (Mathias, Nayak, and Isaacs, 1986; Posdialdo and Richardson, 1991). Our purpose is to expand the use of the TUG by showing validity and reliability for use in the pediatric population. This would provide the pediatric physical therapist access to a quick, easy, and objective measure of functional mobility for use in the clinic. Haley, Coster, Ludlow (1991) state that functional assessments are important in physical therapy because they contribute to detecting changes in a patient's performance over time and allow the practitioner to justify the rehabilitation given. Functional outcome measures allow the practitioner to focus treatment on improving the patient's quality of life (Haley et al.). Functional outcome measures contribute to setting the standard for reimbursement and policy decisions in the field of physical therapy.

Hypothesis

The hypothesis of this study is that there will be an inverse relationship between the TUG and PEDI scores when both tests are used to evaluate functional mobility in a pediatric population.

CHAPTER TWO
LITERATURE REVIEW

Introduction

The "Get up and Go" test (GUG), later changed to the "Timed Up and Go" (TUG) by Podsiadlo and Richardson (1991), has been determined to be a valid and reliable assessment of functional ability in the frail elderly adult population (Mathias, Nayak, and Isaacs, 1986). The Pediatric Evaluation of Disability Inventory (PEDI) is an assessment designed to look at key functional capabilities and performances in children with disabilities. The PEDI has been shown to be both valid and reliable for use in the pediatric population (Feldman, Haley, and Coryell,1990). The following literature review will introduce these two assessments and the implications of concurrent validity.

Reliability and Validity

A functional assessment evaluates the participant in the performance of everyday activities. In order for any functional assessment to be useful, the assessment must first be determined to be valid and reliable. Portney and Watkins (1993) state that the most practical and objective type of validity testing is criterion-related validity. Criterion-related validity, "is based on the ability of one test to predict results obtained on another test" (Portney and Watkins, p. 73). The test to be validated is called the "target test" and is correlated to the known "gold standard test," which has already been established as the criterion measure. Portney and Watkins also state that when the target test and gold standard test are performed within the same time frame concurrent validity can be shown.

"Get Up and Go"

Mathias, Nayak and Isaacs (1986) developed the GUG, to assess the balance of the elderly while walking, which is a functional activity. Mathias et al. (1986) wanted a functional test that would incorporate the assessment of balance and the risk of falling. The test procedure consisted of rising from a chair, walking 3 meters, turning around, and returning to the chair. The test was scored on an ordinal scale of 1 to 5 based on the subject's risk of falling (1 = normal, with no risk of falling to 5 = severely abnormal, with a high risk of falling).

The Mathias et al. (1986) study consisted of 40 subjects with some degree of balance difficulty, and ages ranging from 52 to 94. The subjects were given a trial run of the GUG to familiarize the subject with the test procedure. Mathias et al. (1986) correlated the GUG scores with body sway and gait speed. The subjects' body sway was recorded through the use of a Kistler Force Platform study. Gait speed was recorded automatically through the use of a walkway. The GUG was video-taped and later rated using a scale of 1 to 5 by a group of medical professionals. Results from this study, summarized in Table 1 - Appendix A, show that lower GUG scores indicated normal body sway (r = 0.50), faster gait speed (r = -0.75). Thus, faster gait speed correlated with less body sway (r = -0.482). Mathias et al. (1986) concluded that a GUG score of 3 or more indicated that the subject was at a risk for falling. Mathias et al. (1986) recommended the GUG as a simple, practical measurement of functional balance.

Anacker and Di Fabio's (1992) study investigated the influence of sensory inputs on balance for the elderly with a risk of falling. The Sensory Organization Test (SOT) was used to assess the standing balance and sensory inputs in the subjects, and the GUG was used to assess the general mobility of the subjects. The study used 47 subjects with ages ranging from 65 to 96. Subjects with two or more falls were put into the fall group. A one-way analysis of variance (ANOVA) was used to determine if scores on the GUG were different for fallers vs. nonfallers. There was a significant difference in the scores. Spearman correlation coefficients were also used to determine if lower GUG scores correlated with higher SOT scores and therefore better balance. The Spearman correlation between SOT scores and the GUG scores were greater for the fallers (r_s = -0.67) than for the nonfallers (r_s = -0.44).

"Timed Up and Go"

Podsiadlo and Richardson (1991) modified the GUG from a subjective scoring system to an objective scoring system of the time taken to complete the test. The "Get Up and Go" became the "Timed Up and Go." Podsiadlo and Richardson's (1991) study investigated the clinical usefulness of the TUG in a population of frail elderly, and determined the TUG had good reliability and validity as a measure of balance, gait speed, and function (mobility). The study consisted of 60 frail elderly subjects and 10 normal elderly subjects used for the control group. The subjects were given a practice trial of the TUG and then performed 3 trials. Inter-rater reliability was tested on 22 subjects who performed the TUG for 3 different testers. The scores/times were analyzed with the Interclass Correlation Coefficient (ICC) and determined to be 0.99. Intra-rater reliability was tested on 20 subjects who performed the TUG for the same tester on two consecutive days. The scores/times were analyzed with the ICC and determined to be 0.99.

Thompson and Medley (1995) determined the TUG's inter-rater and intra-rater reliability in their study by having the eight testers practice timing on classmates. The scores were analyzed with the ICC and ranged in value from 0.81 - 0.99.

Podsiadlo and Richardson (1991) determined concurrent validity of the TUG by correlating TUG times with scores on the Berg Balance test and the Barthel Index of ADL, two functional assessment tools that are currently used in the geriatric population. The Pearson correlation coefficients for the TUG, Berg, and Barthel were r = -0.72 and r = -0.51 respectively, as summarized in Table 2 - Appendix A. The correlation coefficient is negative due to an inverse relationship that exists between the TUG score/time and the Berg or Barthel score. As the time to complete the TUG decreases, there is an increase in the Berg or Barthel score indicating an increase of function. Gait speed and TUG times were also correlated to determine if a relationship existed. Podsiadlo and Richardson (1991) concluded that a TUG time of less than 20 seconds indicated that the individual was independent for basic transfers, and a TUG time of more than 30 seconds indicated that the individual tended to be more dependent. Podsiadlo and Richardson (1991, p. 147) reported that the TUG also had content validity because "...it evaluates a well recognized series of maneuvers used in daily life...."

The TUG has been used by various studies as a functional assessment of mobility and balance in the elderly population. MacRae et al (1996) used the TUG to assess mobility and gait speed in their study on the effect of a 12 week walking program in the elderly. The purpose of the study was to determine the effects of a walking program on the endurance, mobility, activity level, and quality of life in the elderly population. Subjects for the study were from two nursing homes and were over the age of 80. Twenty-two subjects were in the walking group and 15 subjects were in the control group. The walking group walked 30 minutes, 5 days a week with a researcher, and the control group attended weekly social visits from the researcher. The measures for the study included: mobility/speed (TUG), strength (handgrip strength), and balance/gait (Tinetti mobility). Endurance was measured with the maximum walk time during a single day. Physical activity was measured with a Caltracs that recorded activity over an 8 hour period. Mobility was measured with the TUG, during which the subjects walked at a comfortable pace. The TUG consisted of three trials at the beginning and at the end of the 12 week program. Results of the study were analyzed with a 2x2 ANOVA. Overall results indicated that a 12 week walking program increased endurance time and distance of walking but had no significant change in physical activity, mobility, or quality of life.

Thompson and Medley (1995) performed a study to investigate the effect of age, gender, and use of a cane on the TUG. The study consisted of 175 community dwellers between the ages of 65 to 79. Subjects were interviewed to collect demographic information. All subjects were given standardized instructions for the TUG, observed a demonstration, and were given a practice trial. Subjects were randomly assigned a test order, cane or no cane, and then performed the TUG twice - once with the cane and once without the cane. Data results were analyzed with multivariate analyis of variance (MANOVA), alpha level 0.05. Results showed that there was no significant difference in performance with age. However gender did effect the TUG times significantly. Females took longer to complete the TUG. Performing the TUG with a cane significantly lengthened the time to complete the test.

The TUG is a mobility test that assesses balance and gait in a functional activity used in everyday life. The TUG, "standardizes most of the basic mobility maneuvers, yet is quick and practical" (Posdiadlo and Richardson, 1991, p. 147). Thompson and Medley (1995) confirmed that the TUG is a quick, easy, and reliable measure of functional mobility in the elderly population. Thompson and Medley (1995, p. 19) stated, "health care professionals need to assess functional mobility to determine if an individual can safely function independently in the community and to assess treatment effects. Quick, easy, and reliable functional measures are required. The Timed Up and Go test is such a measure." Fleming, Evans, Weber, and Chutak (1995), in their investigation of functional assessments of the elderly, believed the TUG to be a condensed practical assessment of function.

Podsiadlo and Richardson (1991) reported the TUG to be a predictive, evaluative, and descriptive tool. The TUG is a useful screening (predictive) tool to help identify and group individuals who may need further assistance (Podsiadlo and Richardson, 1991). Podsiadlo and Thompson state that the TUG is sensitive enough for use in the adult population to evaluate changes in performance over time. The TUG is also a descriptive tool by helping to create and develop treatment goals and activities (Podsiadlo and Richardson, 1991).

Evaluation of Pediatric Assessments

Haley, Coster and Ludlow (1991) have identified six of the most commonly used pediatric functional assessment tools. These include: Battelle Developmental Inventory (BDI), Vineland Adaptive Behavior Scales (VABS), Gross Motor Function Measures (GMFM), Wee-Functional Independence Measure (Wee-FIM), Pediatric Evaluation of Disability Inventory (PEDI), and the Scales of Independent Behavior (SIB). The BDI is a norm-referenced tool which assesses both developmental and adaptive activities in five content domains: personal-social, adaptive, motor, communication, and cognitive performance; most of the activities are based on developmental milestones. The BDI is used to evaluate children from birth to 8 years of age. The VABS evaluates the performance of ADLs for the child from birth to age 19. However, it is not sensitive for the very young child, or those with severe physical or cognitive disabilities. The GMFM is a criterion referenced tool used to evaluate gross motor function of young children especially those with cerebral palsy. The GMFM does not include wheelchair mobility and transfers in the assessment. The Wee-FIM rates the independence of a child from 6 months to 7 years of age on a seven point scale in the various functional domains of sphincter control, locomotion, mobility, communication, social cognition, and self care. The PEDI evaluates self care, mobility, and social function in children ages 6 months to 7.5 years. The PEDI analyzes the use of assistance, modifications, and skill level for the completion of the various tasks. The SIB has four areas of assessment: motor, social interaction, communication, and personal and community living. The SIB is best used on children in the range of 6 years to adolescence.

Westcott, Lowes, and Richardson (1997) reviewed 15 additional pediatric assessment tools for evaluating postural stability and the testing of this construct in children. Of the pediatric assessments reviewed by Wescott, Lowes, and Richardson (1997), three functionally based tests are used in another study by Lowes for her unpublished doctoral thesis (1996). These three are the Functional Reach Test (FRT), the Pediatric Clinical Test of Sensory Interaction for Balance (P-CTSIB), and the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP). Donahoe, Turner, and Worrell (1994) determined the FRT to be an appropriate measure of balance in a child. The FRT assesses the dynamic balance of the child and is useful for yielding information about functional, movement based activities. The CTSIB is an adult assessment tool which evaluates the ability to process and use visual, somatosensory, and vestibular input for standing balance (Shumway-Cook, and Horak, 1986). There is also a pediatric version of the CTSIB, known as the Pediatric Clinical Test of Sensory Interaction for Balance (P-CTSIB). Scores from the P-CTSIB have been correlated to the ability to perform functional activities requiring postural control (Westcott, et al. 1997). The BOTMP assesses gross and fine motor abilities of children with minor physical impairments, but is not a useful tool to assess children with major impairments (Bruininks, 1978).

In Lowes' (1996) unpublished study, a comparison of functional assessments was performed on the running speed section of the BOTMP, the self-care and mobility sections of the PEDI, the P-CTSIB, and the TUG. This study was to evaluate the standing balance of children with spastic cerebral palsy using a systems approach to identify the impairments associated with poor balance. Lowes (1996, p. 86) study asked the following question with her research: "Do total time/sway scores that children with cerebral palsy achieve on the six P-CTSIB conditions correlate with their scores on the TUG, Run of the BOTMP and the self-care and mobility functional skills sections of the PEDI?" The study proved that the TUG has "some" validity as a functional postural assessment tool in the pediatric population. The study consisted of 35 subjects with spastic cerebral palsy, 17 girls and 18 boys, ranging in age from 6 years to 14 years, 11 months. Two researchers collected the data for the tests. The primary researcher collected all of the data from the force output, range of motion, TUG, and Run portion of the BOTMP data independently. A research assistant collected the PEDI data for each child. Two researchers were needed to complete the P-CTSIB with each subject.

Lowes' (1996) study used Spearman correlation coefficients to determine the variables. Correlations with a significance of $p < 0.01$ were noted with the Run portion of the BOTMP ($r_s = -0.665$), the PEDI functional skills mobility subtest ($r_s = 0.627$), and the TUG ($r_s = -0.677$). Lowes determined that the TUG had good inter-rater reliability, $r = 0.99$, when tested on children. Lowes found that the subjects scores on the P-CTSIB only moderately correlated with their scores on the TUG, BOTMP, and the PEDI. This finding suggests that the P-CTSIB is measuring similar, but not identical domains to the other three tests. Lowes explained this by stating that the P-CTSIB is a measure of the subjects static balance, while the other tests measure the subjects dynamic balance.

<u>Pediatric Evaluation of Disability Inventory</u>

The PEDI has been shown to be a valid and reliable functional assessment for use in the pediatric population. The PEDI is an assessment tool designed to look at key functional capabilities and performances in children with disabilities ages 6 months to 7.5 years. The PEDI measures the functional capabilities of children to perform ADLs instead of developmental skills (Wescott, Lowes, and Richardson, 1997; PEDI Manual, 1992).

Nichols and Case-Smith, (1996, p. 15) stated the following: "Although other functional assessments have been developed (e.g., the Wee-Functional Independence Measure (WeeFIM)), none is as well standardized and developed as the PEDI." Nichols and Case-Smith (1996) performed three studies on the PEDI. The first was the intra-rater reliability. Two interviews were done with parents separated by a one-week interval (n = 23). ICC summary scores for intra-rater reliability were 0.98 for each of the three domains of the PEDI (See Table 3 of Appendix A). The second study determined the inter-respondent reliability (n = 17) by investigating the scores recorded from parents and therapists (See Table 4 in Appendix A for the results). The third study done by Nichols and Case-Smith compared the Peabody Developmental Motor Scales (PDMS) and the PEDI to evaluate concurrent validity (n = 25). The Pearson Correlation coefficients showed moderate to high (r = 0.64 - 0.95) results for the subscale scores from the PDMS and the PEDI's summary scores for each domain. Nichols and Case-Smith (1996) concluded that the PEDI is a useful tool in the evaluation of children with developmental disabilities. The PEDI can be used as a parent-report questionnaire, can be administered through interview, and the PEDI has high intra-rater reliability .

Feldman, Haley, and Coryell (1990) determined the concurrent and construct validity of the PEDI in the disabled and nondisabled populations by comparing scores of the PEDI with the Battelle Developmental Inventory Screening Test (BDIST). Twenty children aged 2 to 8 years, having arthritic conditions and/or spina bifida, and 20 nondisabled children were scored on the BDIST cognitive domain and the PEDI. A Pearson correlation coefficient between the two tests was found to be r = 0.7 to 0.8 therefore, yielding evidence that the PEDI is a valid measurement. Construct validity of the PEDI was supported by a significant difference of scores on the PEDI between disabled and nondisabled groups. The construct validity identified the PEDI as a better discriminator than the BDIST.

Haley, Coster, and Faas (1991) determined that the PEDI also had content validity. A panel of 31 experts reviewed the PEDI for its feasibility. Eighty percent of the experts judged the PEDI as a good or excellent tool to measure function, 74% felt the PEDI was good to excellent as a predictor of change, more than 80% felt the PEDI was feasible both as parent interview and professional assessment, and more than 80% of the experts felt that the PEDI was a clinically feasible instrument.

The PEDI has been standardized with a normative sample study using a total of 412 nondisabled children, aged 6 months to 7.5 years (Haley, Coster, Ludlow, Haltiwanger, and Andrellos, 1992). Haley, Coster, Ludlow, Haltiwanger, and Andrellos (1992) developed the test. The test is administered by professionals, and has been validated for use on children with a wide range of motor and cognitive disabilities. Three types of measurements are provided by the PEDI. The test can determine functional deficits, discriminate between normal and delayed performance, and monitor rehabilitation progress (Haley, Ludlow, and Coster 1993).

Reid, Boschen, and Wright (1993) performed a comprehensive critique of the PEDI, evaluating the instruction manual and other research that has been done on the PEDI. Reid, Boschen, and Wright (1993) critiqued the PEDI for its purpose, target population, content domains, item formats, item selections, measurement scales, standardization of the PEDI including normative and clinical samples, psychometric properties (reliability, internal consistency, inter-rater reliability), validity (face, content, construct, concurrent, discriminant), and qualitative evaluation requirements (time, ease of administration, scoring). The weaknesses and strengths of the PEDI were listed. The weaknesses include: questions about scoring skills that have been mastered, handling missing data when scoring, and the lack of evaluation of quality and consistency of performance. The PEDI also does not adequately address school-related issues when administered in a school setting, and there is no recognition as to the role of attention, motivation, or fatigue in performance. The strengths of the PEDI included: the PEDI is useful for parent interview, focuses on social skills along with self-care and mobility, the domains can stand alone for analysis, the score card is well designed, normative data is available, and the time to complete the PEDI is reasonable.

The intent of this study is to show that the TUG is a valid measurement of functional mobility to be used in the pediatric population. The authors intend to use the PEDI as a "gold standard" for the purpose of validating the TUG as the "target test." A high score on the PEDI indicates a high level of independence and function. Therefore, an inverse relationship should exist between these two assessment tests, with low TUG scores and high PEDI scores. Concurrent validity will be shown through use of a Spearman correlation coefficient of the TUG score with the PEDI score. The PEDI was chosen because it is well standardized and has high intra-rater reliability. The PEDI score card is well designed, the mobility domain may be used separately, normative data is available, and the time to administer the questionnaire appears to be reasonable. The PEDI is used with children in the 6 to 7 year age range, and the tool is effective for use as a parent-report questionnaire/interview. The mobility domain was chosen because the items in the domain are the most like the skills needed to complete the TUG. If a relationship can be shown, the research will contribute to making the TUG a useful functional mobility measure in pediatric physical therapy.

Haley, Coster, and Ludlow (1991) suggest that further research needs to look at specific groups of disabled children to gather normative data for these populations. Studies need to be done on the developmental patterns of children with disabilities. Test developers and clinicians need to work together to collect data to help determine reliability and validity issues that are involved with functional assessment instruments.

CHAPTER THREE
METHODOLOGY

Subjects

After approval from the Grand Valley State University Human Subjects Review Board (Appendix B), 30 male and female children, age 6 to 7 years, from local area schools were recruited for this study. The subjects had a variety of physical and cognitive disorders. Participation of the subjects was on a voluntary basis with parental or guardian consent required (Appendix C).

For inclusion, each subject was required to be ambulatory with no physical assistance other than the use of an ambulation device (such as a walker, cane, crutch, orthosis, etc.). All participants in the study were required to have their parent or guardian sign a form declaring that the child had no health conditions that contraindicated participation in the study (Appendix F). These conditions included any health conditions, such as a cold or influenza, which would put the child at risk of infection or that could cause harm to the child. Other conditions that would contraindicate participation would be exacerbations of existing symptoms or illness. Each child was also required to have the cognitive ability to follow verbal commands as given by the researchers. Each child needed to be able to follow a three-step command to complete the TUG. Cognition was assessed by each child's school physical therapist.

Study Site

Data collection of the TUG took place in an unoccupied room or hallway in the schools where the subjects were students. Written consent and approval was obtained from each school (Appendix D) before data collection began at that school. The TUG was administered on a hard level surface. The data collection for the PEDI mobility domain was obtained through telephone interviews with the parent or guardian of each subject.

Study Design

To determine concurrent validity of the TUG as a functional mobility assessment in the pediatric population, a correlational design study was used. The TUG scores of each subject were correlated with each subject's PEDI score, using the Spearman's rank Correlation Coefficient. This correlation design was used to determine what relationship exists between the TUG and the PEDI. An inverse relationship was expected; as TUG time decreases, the PEDI score increases.

The subjects were a sample of convenience from the population. Each subject was scored on the TUG and the PEDI.

Equipment and Instruments

In order to perform the TUG a few common objects were needed. The equipment for this study included: a child's chair, a stopwatch, a tape measure, and a construction cone. The chair's dimensions were as follows: floor to seat height 12.4 inches, seat depth 11.2 inches, and back support height 22.4 inches from floor. Instruments used for this study included: the PEDI mobility domain evaluation form (Appendix J), the TUG collection form (Appendix I), and the demographic data collection forms (Appendix F & G).

Procedure

The researchers contacted the physical therapists and teachers of area schools to identify possible subjects for this study. A letter of consent/approval (Appendix D) was then delivered to the schools to seek consent/approval for the use of their facility for this research. A letter of explanation (Appendix E), an informed consent form (Appendix C), and a demographic form (Appendix F) were mailed to the parents or guardians of prospective subjects making them aware of the opportunity to participate in the study. The parent or guardian returned the demographic and consent forms to the child's teacher or to the researchers by mail prior to data collection. Once parental consent was given, the physical therapist was asked to fill out a demographic information form on each subject (Appendix G). Data in this study were collected by the researchers Susan Carman, Christina Rook, and Cathy Ruprecht.

Before data collection on the TUG began, each child was screened by the child's school physical therapist to determine their ability to follow two and three step commands (Appendix H).

The procedure for data collection for the TUG included asking each subject to sit in the chair until given the verbal command "GO" by one of the researchers. The subject was then required to stand up, walk (not run) a measured and marked distance of 10 feet, walk around a construction cone, walk back to the chair, and sit down. The subject was timed during this activity. The time began when the researcher said, "GO" and the timing ended when the subject's buttocks touched the seat of the chair. The researcher first demonstrated the test, and then the subject was given a practice trial. Three timed trials of the test were performed and recorded (Appendix I) with each subject, and then averaged to get one final time. A 30-second rest period was given between each trial. In order to standardize the testing environment, parents were not present when the child was performing the TUG. Upon completion of the testing, each subject was given a sticker for participation in the study.

The procedure for the data collection of the PEDI mobility domain consisted of a parental or guardian interview by telephone. Questions from the PEDI mobility domain score form were read to the parent or guardian, and the answers were scored either "capable" or "unable" on the scoring sheet (Appendix J). To receive a score of "capable," the subject was required to be able to perform, in most situations, the mobility task described by the PEDI. The child was scored "unable" if the child was unable or limited in capability to perform the task in most situations (PEDI manual). The total score for each participant was calculated according to the guidelines of the PEDI scoring form.

Time commitment for each child participating in this study was approximately 10 minutes. The child's parent or guardian was required to be available by telephone for completion of the PEDI mobility domain, which required approximately 15 minutes to complete.

Reliability

A small pilot study with a sample size of 12 non-disabled children was performed prior to the study. The pilot study was used to determine the researchers' inter-rater and intra-rater reliability. These children were recruited from family and neighborhood friends. The children's performance of the TUG was video-taped. Inter-rater reliability of the TUG was tested by having each researcher review and time the video of each participant's performance of the TUG. The results from each researcher were compared and analyzed with the Inter Class Correlation Coefficient (ICC) of 0.9968. To determine the intra-rater reliability, each researcher viewed and timed the performance of the TUG from the videotape on day one. The next day each researcher reviewed and scored the same performances. The results of day one were compared with the results from day two. An ICC score of 0.9 or above was used to signify the researchers' reliability and accuracy in the testing procedures. The intra-rater ICC scores for the three testers ranged from 0.9981 to 0.9996.

Reliability of the PEDI mobility domain interview was not determined because administering the PEDI consists of reading standardized questions and recording parent or guardian responses.

CHAPTER FOUR
RESULTS

Subjects

A total of 18 subjects met the inclusion criteria and were tested. From the 30 recruitment letters which were sent to parents, 10 were not returned and 20 children were approved for participation in this study, but 2 of these were eliminated due to inability to meet the inclusion criteria.

Of the 18 subjects who participated, 8 were male and 10 were female. An analysis of gender differences was not performed. Nine of the subjects were 6 years of age and the other nine were 7 years of age (refer to Table 4.1). Diagnosis varied greatly among the participants: eight had Cerebral Palsy (CP), three were Physically and Otherwise Health Impaired (POHI), two had Autism (AI), one had Down's Syndrome, one had a Traumatic Brain Injury (TBI), one had Duchenne's Muscular Dystrophy (MD), one had a Cerebral Tumor, and one had a lower extremity Peripheral Neuropathy (refer to Table 4.2). Of these subjects, 7 of the 18 used an ankle-foot orthosis (AFO) and one also used a cane. All the children were receiving school-based physical therapy before, during, and after the time of testing.

Table 4.1

Demographics of Subjects

Subject Description	n	%
Male	8	44%
Female	10	56%
Age 6	9	50%
Age 7	9	50%
Cognitive	4	22%
Physical	14	78%

Table 4.2

Breakdown by Subject Diagnosis

Subject Diagnosis	**n**	**%**
Physical Classification		
Cerebral Palsy	8	44%
POHI	3	17%
Muscular Dystrophy	1	5.5%
Cerebral Tumor	1	5.5%
Peripheral Neuropathy	1	5.5%
Cognitive Classification		
Autism	2	11%
Down's Syndrome	1	5.5%
Traumatic Brain Injury	1	5.5%

Results

The three TUG trials, performed by each participant, were averaged together to provide a single TUG score. The average TUG score was then correlated with the mobility domain score of the PEDI, using the nonparametric Spearman's Rank Correlation Coefficient. A nonparametric correlation was used due to the fact that the PEDI scores were ordinal data. Portney and Watkins (1993) state that a correlation coefficient of $r = 0.00$ to 0.25 signifies little or no relationship, $r = 0.25$ to 0.50 signifies a weak relationship, $r = 0.50$ to 0.75 indicates a moderate relationship, and an r-value of 0.75 and greater indicates a strong relationship. A one-tailed Spearman's Rank Correlation Coefficient showed a weak inverse relationship ($r_s = -0.386$) between the TUG and PEDI scores, with a significance level of $p = 0.057$ (refer to Figure 4.1). The significance level suggests a relationship between the TUG and PEDI, which was not based on chance.

The data were also analyzed by separating the cognitively and physically challenged children's scores. When the data were run again with just the scores of the physically challenged participants, a moderate inverse relationship was shown ($r_s = -0.523$), with a significance level of $p = 0.027$ (refer to Figure 4.2). Again, the significance level indicates that the results did not happen by chance. The data of the cognitively involved subjects was inconclusive due to the extremely small sample size of four children.

The data were also analyzed with the correlation of determination (r^2), which indicates the percent of common variability between two variables. When all subjects' scores (both cognitively and physically involved) were analyzed, r^2 was 0.1489 (14.89%), indicating that the TUG is measuring approximately 15% of what the PEDI measures. When only the physically involved children's scores were analyzed, the r^2 was determined to be 0.2735 (27.35%), indicating that the TUG results had 27% in common with the PEDI results. The small amount of overlap between the TUG and the PEDI may be explained by the fact that the PEDI measures more than just functional mobility.

A review of the individual TUG and PEDI scores for physically challenged subjects, showed that as the TUG scores increased, there was a trend toward lower PEDI scores (refer to Figure 4.2). This, plus the statistical results, indicate that the TUG may be a moderate predictor of functional mobility when used with physically challenged individuals.

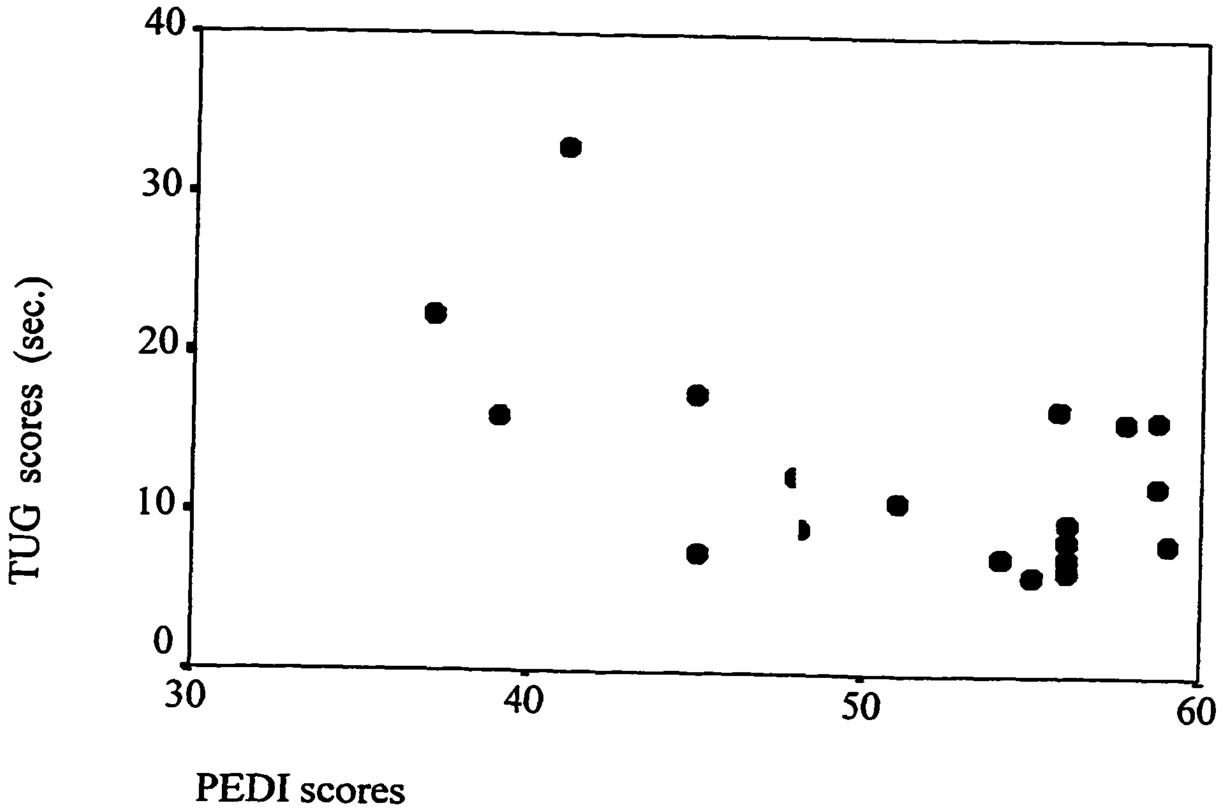

Figure 4.1. Correlation of PEDI and TUG scores when all 18 subject scores were analyzed (r_s = -0.386, n = 18).

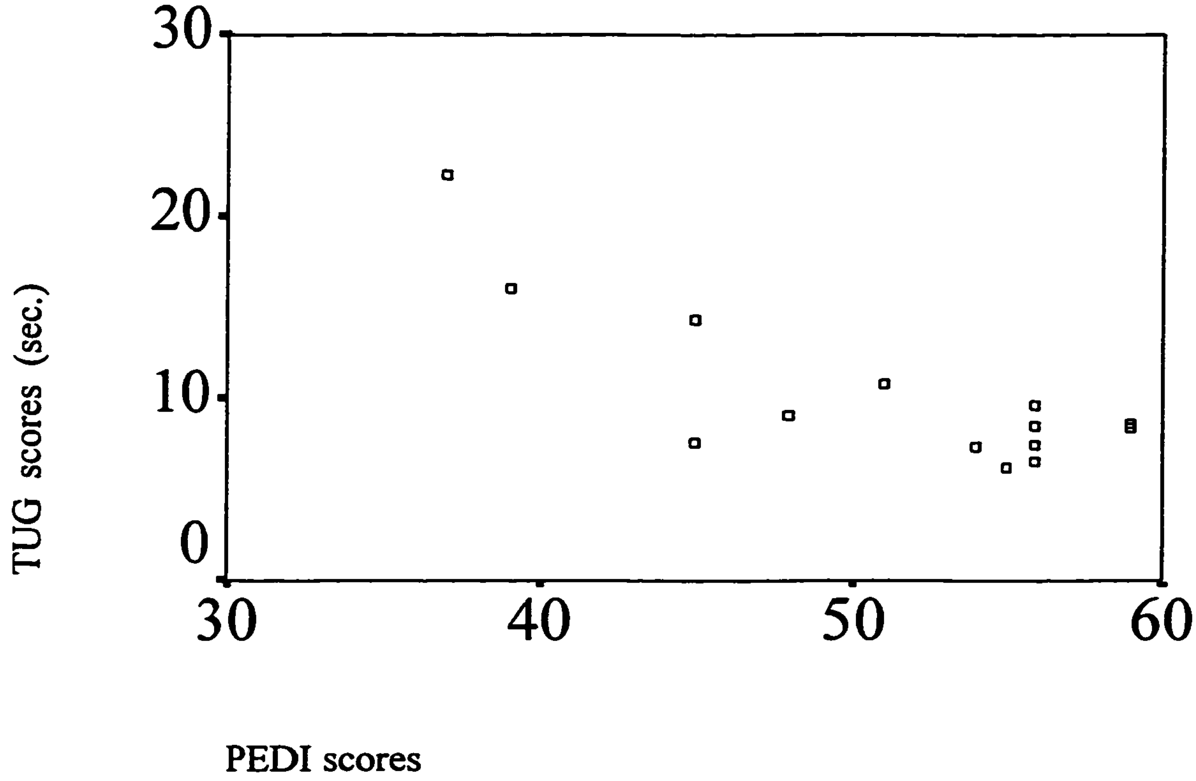

Figure 4.2. Correlation between PEDI and TUG scores for only the physically impaired subjects ($r_s = -0.523$, $n = 14$).

CHAPTER FIVE
DISCUSSION AND LIMITATIONS

Discussion

This study was designed to assess the validity of the TUG as a predictor of functional mobility in the pediatric population. In order to assess the validity, the TUG scores were correlated with the mobility domain of the PEDI. Eighteen subjects participated in the study. TUG and PEDI scores were obtained for each participant. The results of the data analysis showed a weak inverse relationship for the group as a whole, while a moderate inverse relationship was shown for those subjects with only physical disability.

The results from this research may have been influenced by the sample size. Portney and Watkins (1993) state that a correlation coefficient is very sensitive to the size of the population in order to obtain a meaningful relationship. A stronger relationship may have been shown if there had been a greater number of subjects involved in the study.

For the TUG, all three researchers obtained high inter-rater and intra-rater reliabilities with ICC values ($r = 0.9981$ to $r = 0.9986$) in a pilot study of 12 non-disabled subjects. The high ICC scores indicate that the measurements taken in the study were accurate and reliable. PEDI scores were obtained through parental interview by the researchers; therefore, the determination of inter-rater and intra-rater reliabilities was not necessary due to the standardization of questions on the PEDI mobility domain.

Podsiadlo and Richardson (1991) determined concurrent validity of the TUG, in the frail elderly, by correlating the TUG to both the Berg Balance and the Barthel Index of ADL. The Pearson correlation coefficient for the TUG and Berg Balance was $r = -0.72$; the coefficient between the TUG and Barthel Index was $r = -0.51$. Podsiadlo and Richardson's research with 60 subjects determined the TUG to be a valid and reliable test based on the result of these correlations. The present study only had a total of 14 physically challenged subjects and had a moderate correlation, with a Spearman correlation coefficient of $r_s = -0.52$ for the physically impaired subjects and $r_s = -0.39$ when all subjects' scores were analyzed (cognitively and physically challenged). Therefore, the TUG shows a possibility of being useful in measuring functional mobility in physically challenged children, but not in those with cognitive impairment.

Podsiadlo and Richardson (1991) also stated that the TUG is useful to evaluate a series of maneuvers used in daily life, such as sit to stand transfers and walking. These maneuvers are used everyday by children in a classroom; therefore the TUG may be a useful measure of functional mobility in the school.

Thompson and Medley (1995) found the TUG to be a quick and easy test to administer. The researchers of this present study agree that the TUG is quick and easy to administer, which makes the TUG useful in the school setting. The directions and the tasks of the test are simple and easily followed by the physically challenged subjects, but were noted to be very challenging for the cognitively impaired children. The cognitively impaired children demonstrated a tendency to "run" throughout the testing space, and did not follow the directions given to return directly to the chair. Due to the extra length of time spent traveling throughout the test space, the TUG scores of these children were higher than expected and did not demonstrate a true reflection of their functional ability.

The TUG requires the individual to only walk a distance of 20 feet, 10 feet to the cone and 10 feet back to the chair. Therefore, the TUG is measuring short distance walking capabilities. Due to the fact that only a small distance is evaluated, the TUG may not truly be evaluating the individuals functional mobility, since individuals may need to walk more than 20 feet at a time. The TUG is a good measurement for short distances, such as classroom ambulation, but may not appropriately measure community ambulation distances. The 3 or 6 minute walking tests may be more appropriate at measuring functional mobility for community distances. The TUG may be a useful measure of classroom functional mobility, which consists of rising from sitting, walking short distances, and maneuvering around objects.

Lowes' (1996) study, using a pediatric population, found the TUG to have validity as a functional postural assessment tool. The researchers of this present study did not look specifically at posture, as did Lowes, but agree that the TUG could be a useful tool to use in the pediatric population.

The PEDI manual (1992) states the PEDI is a valid functional assessment tool for ages 6 months to 7.5 years. Reid, Boschen, and Wright (1993) identified some strengths of the PEDI such as: the PEDI is a useful tool for parent interview; the PEDI domains can stand alone for analysis; and the time to complete the PEDI is reasonable. For these reasons, the researchers chose the PEDI to correlate to the TUG.

Both the TUG and PEDI include sit to stand transfers (from a child size chair) and short-distance ambulation; therefore, a relationship may exist between these two tests.

Although the TUG and PEDI are similar in that they assess transfers and ambulation, differences between the tests were noted. Several questions on the PEDI mobility domain ask about the ability of the child to get out of an adult size chair, off an adult size toilet, and into and out of an automobile independently. The PEDI also asks about the ability of the child to travel distances, both over even and uneven surfaces, greater than that that required by the TUG. In addition, the PEDI has not been found to adequately address school related issues when used in the school setting (Reid et al., 1993). Further research could involve adaptation of the PEDI for use in the school setting.

Past research by Podsiadlo and Richardson (1991) found the TUG to be useful in the frail elderly population as a predictor of functional mobility, balance, and falls. Based on the moderate correlation ($r_s = -0.52$) of the current study, the TUG may be a possible tool for measuring functional mobility in physically challenged children from ages 6 to 7 years. This age range was chosen because children of this age are in the school system, and are required to function within the classroom setting. This age range also met the PEDI age requirements. Further studies could assess children of other ages, in order to expand the use of the TUG to children of all ages.

Limitations

An important limitation of this study was the small sample size, which affected the strength of the correlation between the TUG and PEDI. Typically a sample size of 30 is needed for a good correlation study (Portney and Watkins, 1993). The small sample size also limited the ability for the results to be applied to all pediatric populations. Portney and Watkins (1993) state that a relationship between scores may not be demonstrated with a small sample size. Further studies with larger groups of subjects are necessary to show statistically significant relationships between the TUG and PEDI.

Another limitation of the study involved the limited geographical area from which the researchers were able to recruit subjects. This contributed to the smaller sample size. Due to the limited number of subjects in this study, generalizations cannot be made of the TUG's ability to predict, evaluate, and describe functional mobility in the pediatric population.

The wide variety of subject diagnosis created an unexpected variability in the performance of individuals. This variability was particularly evident in the inability of the cognitively challenged children to follow the testing directions. The variability of diagnoses further adds to the inability to generalize the data to any specific population. For example, it cannot be said that all children with Cerebral Palsy will have TUG scores that will fall within a predicted range. Studies focusing on specific disabilities may be beneficial to identify TUG score ranges for these populations. Studies with normal children may also be beneficial in order to collect normative data on the length of time to complete the TUG. Also, because the subjects were only of the ages 6 and 7 years, generalizations cannot be made to other age groups regarding the ability of the TUG to measure functional mobility.

Another factor that could not be controlled in the study was the speed at which the children walked for the TUG. The children were instructed to walk at their normal pace, and not to run. However, the children knew they were being timed, which may have influenced the speed of their walking.

Conclusion

In conclusion, the research results indicate that a moderate inverse relationship exists between the TUG and the PEDI for the physically impaired subjects. The results of the study validate the hypothesis that a relationship between the TUG and PEDI exists. Therefore, the TUG has a capability, although limited, to measure functional mobility in physically disabled children ages 6 and 7 years. The TUG may also be used as a quick screen of functional classroom mobilty or as an outcome measure, to determine if the child is progressing towards their goal. Further research is necessary to investigate the validity of using the TUG with the pediatric population.

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Appendix A:

Table 1: Get Up and Go Results (Mathias, Nayak, Isaacs, 1986)

Measurement	Pearson coefficient	Implication
GUG & body sway	r = 0.50	low GUG score = Normal body sway
GUG & gait speed	r = -0.75	low GUG score = faster gait speed
Gait speed & sway	r = -0.482	faster speed = less body sway

Table 2: Timed Up and Go Results (Podsiadlo & Richardson, 1991)

Test	Pearson coefficient	Log transformed
TUG & Berg	r = -0.72	r = -0.81
TUG & gait speed	r = -0.55	r = -0.61
TUG & Barthel	r = -0.51	r = -0.78

Table 3: ICC scores for the PEDI

Functional Skill Scales:	ICC raw score	ICC summary score
Self-Care Domain	0.67 - 0.99	0.98
Mobility Domain	0.68 - 1.0	0.98
Social Function Domain	0.70 - 1.0	0.98

Table 4: Inter-respondent reliability of PEDI

Functional Skill Scales:	ICC sum totals
Self-Care Domain	0.85
Mobility Domain	0.92
Social Function Domain	0.80

Appendix B

Human Subjects Review Board

October 8, 1998

Christina Brodbeck, Susan Carman
Cathy Ruprecht
1125 Fairfield Ave. NW
Grand Rapids, MI 49504

Dear Christina, Susan, and Cathy:

The Human Research Review Committee of Grand Valley State University is charged to examine proposals with respect to protection of human subjects. The Committee has considered your proposal, *"Validation of the "TUG" Test as a Functional Mobility Assessment Tool in the Pediatric Population"*, and is satisfied that you have complied with the intent of the regulations published in the Federal Register 46 (16): 8386-8392, January 26, 1981.

Sincerely,

Paul Huizenga, Chair
Human Research Review Committee

February 5, 1999

Susan Carman
1125 Fairfield Avenue NW
Grand Rapids, NW 49504

LANSING SCHOOL DISTRICT
Committed to Quality

Dear Ms. Carman:

In regard to the proposed study, "Validation Of The "TUG' Test As A, Functional Mobility Assessment Tool In The Pediatric Population", the request to conduct the study in the Lansing School District has been approved. The identification of the Lansing School District shall not appear in any publication without the expressed permission of the school district.

The following comments apply to the study:

> *Staff participation in the study is strictly voluntary. Parent consent forms must be on file at the school prior to any student involvement Jeanne Boyd, Physical Therapist, has agreed to participate in this study with you and must be in agreement with the proposed activities in this study.*

If you have any questions or need additional information, please contact me (325-6460).

Thank you.

Marian Phillips

Research & Evaluation Services Office
500 W. Lenawee St.
Lansing, Michigan 48933
An Equal Opportunity District

Appendix C:

Grand Valley State University
Department of Physical Therapy
Informed Consent Document

PRINCIPLE INVESTIGATORS: Barbara Baker, M.S., P.T., Susan Carman SPT, Christina Rook SPT, Cathy Ruprecht SPT.

STUDY TITLE: Validation of the Timed up and Go Test as a Functional Mobility Assessment Tool in the Pediatric Population.

STUDY NUMBER:

SUBJECTS NAME:

I, ____________________, freely and voluntarily agree to allow my son/daughter to participate in the research project under the direction of Barbara Baker, M.S., P.T., Susan Carman SPT, Christina Rook SPT, and Cathy Ruprecht SPT to be conducted at my child's school. I understand the following statements to be true:

1. This study is being conducted to evaluate the effectiveness of using the Timed Up and Go Test as an evaluation tool to measure the functional mobility of children ages 6 and 7.

2. My child has been selected for participation in this study because he/she has a developmental disability, is between the ages of 6 and 7 years old, and is able to follow verbal commands given by the researchers. Also, my child does not require assistance with walking other than with an assistive device (such as a walker or a cane).

3. My child does not have any health conditions that would contraindicate participation in this study. This may include any worsening of existing symptoms or illnesses.

4. For this test my child will be asked to follow the test commands given by one of the researchers. The commands will be a version of the following: "Please stand up, walk at a normal pace around that cone, then come back and sit down."

5. I will be asked questions about my child's ability to perform tasks referred to as activities of daily living which have to do with mobility and walking. These tasks include: transfers and walking activities.

6. The total testing time for this study is estimated at 30 minutes or less.

7. The testing procedures should be fun. The researchers do not expect any discomfort during the test, however, my child will be instructed to report any pain or discomfort that may develop during the test.

8. Upon the completion of the study, each child will receive a sticker for their participation in the study.

9. I have the right to remove my child from this study at any time during the study, for any reason, without penalty. Removal of my child from this study will in no way effect my child's treatment at school.

10. I understand that if my child objects to participation in this study, he/she will not be coerced or expected to participate in the study, regardless of whether I have provided full consent or not.

11. The results from the tests will be used in a Master's research project for students in Grand Valley State University Physical Therapy Program, but all subjects names will be confidential.

12. I understand that the results of this study may be published in a clinical journal. I also understand that all results will be confidential and that no names or personal information will be used in publication.

13. I have the right and opportunity to ask any questions or contact any of the testers regarding the study at any time, and to have these questions answered to my satisfaction. The phone numbers at which the testers can be contacted are: Susan Carman (616) 735-1710, Christina Rook (616) 667-9523, and Cathy Ruprecht (616) 394-4957. I may contact Barb Baker (616) 895-3356, the faculty advisor for this research project, at Grand Valley State University Physical Therapy Department or Paul Huizinga, Chairman of the Human Review Board, (616) 895-2470 in the Biology Department regarding my child's rights as a participant in the study.

I acknowledge that I have read and that I understand the above information, and based on this information, I am voluntarily agreeing to allow my child to participate in this study.

____________________ ____________

Signature of parent/guardian of participant — Date

____________________ ____________

Signature of witness — Date

Please check here______ if you are interested in receiving a summary of the results of this study. Please print your address:

____

_______________________________________Phone:(____)___________

I have explained and defined in detail the research procedures to which the subject has consented to participate.

__________________________ ________________

Signature of researcher Date

______________________ _______________

Signature of witness Date

Appendix D:

Facility Consent Form

1. ________________(Name of Facility) state that we grant permission to Susan Carman, Christina Rook, and Cathy Ruprecht, physical therapy students from Grand Valley State University, to use our facility as a site for the research study, "Validation of the Timed Up and Go test as a functional mobility assessment tool in the pediatric population."

2. **Purpose:** We understand that the purpose of this study is to determine if the Time UP and Go test (TUG) is a valid and useful instrument to use on children to assess their functional mobility. We understand that the knowledge gained from the research will help physical therapists by creating another useful tool to assess children and document the effects of therapy.

3. **Experimental Procedure:** We understand that the experiment will require the students' participation for approximately ten minutes. During that time the student will be asked to rise from a chair, walk 3 meters, turn around, return to the chair, and sit down. The child will perform this sequence three times. Each trial will be timed. The parent/guardian of the child will be contacted by phone to answer questions about thier child's ability to perform activities around the home.

4. **Staff Consent:** We understand that any staff directly involved will have been informed of the experiment by one of the researchers. The staff will have the opportunity to ask questions. We understand that the staff has the right to refuse or withdraw from the study at any time, and that refusal or withdraw will not affect the staff members standing at ____________________ (Name of Facility) now or at any time in the future.

5. **Space Commitment:** We understand that the researchers will require use of a quiet unoccupied room or hallway for the performance of the study.

6. **Student Commitment:** We understand that the time commitment of each student will be approximately ten minutes.

7. **Parent Commitment:** We understand that the time commitment for each parent/guardian will be approximately fifteen minutes to complete a telephone interview with one of the researchers.

8. **Right of Privacy:** The information obtained from this study will be treated as privileged and confidential. If the results are published the students or facility will not be

identified. The information will be used for statistical purposes with the students' and facility's right of privacy retained.

9. **Research Results:** We understand that the results of the study will be available to us upon our request.

10. **Consent:** We acknowledge that we have been given the opportunity to ask question about the study, and that these questions have been answered. We understand that we may contact Christina Rook (616) 667-9523, Susan Carman (616) 735-1710, Cathy Ruprecht (616) 394-4957, Barbara Baker, research committee chairman, (616) 895-3356 if wh have further questions. If we have questions about the participants rights we understand that we can contact Paul Huizenga, Human Subject Review Board Chairman at GVSU, (616) 895-2472. We acknowledge that we at ____________________ (Name of Facility) have read and understand the above information and agree to participate in the study "Validation of the 'Timed Up and Go' as a functional mobility assessment tool in the pediatric population."

______________________________ ______________

Please Print Facility Name Date

______________________________ ______________

Principal Date

______________________________ ______________

Witness Date

Appendix E:

Letter to parents about the research project

Dear parent/guardian,

We are writing to inform you of the opportunity for your child to participate in a "fun" research project. As three Grand Valley State University physical therapy students, we are currently working on a group research project to complete our degree requirements.

Our project needs the help of your child. If you decide to allow your child to participate, he/she will be asked to perform a few simple activities such as: standing up, walking 10 feet, turning around, and sitting down. You too will also be asked to participate in this "fun" study. Your participation will consist of an interview/telephone call to provide the researchers with more information about your child's ability to complete activities at home such as: climbing stairs, walking indoors and outdoors, getting into the car and bathtub. Time commitment for your child would be 10 minutes or less, and will be completed during the school day. The time commitment for you as the parent would be approximately 15 minutes.

The information that you and your child provide will help the researchers to work towards establishing a new means of evaluating children in the clinic. If you are interested in participating in this study please fill out the enclosed information and informed consent, and return them to the school. Please feel free to contact any of the researches if you have questions or need more information.

If you have any questions about your child's rights as a participant in this study, please feel free to contact Paul Huizenga, chair of Grand Valley's Human Subjects Review Board, at (616) 895-2472.

Thank you for your time. We look forward to working with you and your child.

Sincerely,

____

Christina Brodbeck-Rook, SPT (616) 667-9523

____

Susan Carman, SPT (616) 735-1710

____

Cathy Ruprecht, SPT (616) 394-4957

Appendix F:

DEMOGRAPHIC INFORMATION FORM

Name of child: ________________________________

Age of child: ______________

Gender of child: ____________

Name of facility/school presently attended by child:

____

Is your child receiving any therapy? ______
If yes what type and how many hours per week? ______________________

____

How long has your child had this disability/problem: ________________

Does your child have any health problems that would prevent his/her participation in the study: ________________________

Please describe how your child walks/moves around the house. Are any assistive devices used?

____

____

____

How far is your child able to walk in the house? ___________________________

____

How does your child get around out in the community (ie wheelchair, crutches, etc.) and what distance is your child able to walk?

____

____

____

Parent/Guardian Name:______________________________

Phone number: ___________________________________

Best time to reach you: _______________________

Appendix G:

Physical Therapist Screen

Child's Name________________________ Age_____________

Child's Diagnosis_____________________

What device if any does the child use to ambulate in the classroom/school? (Please circle)

Walker
Cane
Crutches
AFO
Other _______________________

How far does the child walk in the classroom?_________________________________

Identify those areas that are of concern as you work with and observe this student. Please check the appropriate areas.

____ Body Awareness

____ Balance

____ Coordination

____ Muscle Weakness

____ Gait & Mobility

____ Motor Skill Learning

____ Motor Speed

____ Motor Endurance

____ Self-Care Management

____ Gross Motor Performance

Comments:____
____
____
____

Appendix H:

COGNITIVE SCREENING FOR FOLLOWING VERBAL COMMANDS

Three questions of directions to see if the child can follow verbal commands, because in order to complete the TUG the child must be able to follow a 3 step verbal command.

1. Please pick up the tennis ball and hand it to me.

2. I want you to stand up, turn around, and sit back down.

3. I want you to pick up the ball, stand up, and throw it to me.

Appendix I:

DATA COLLECTION FORM
TIMED UP AND GO

Subject Number: ____________

Trial 1 time: ____________

Trial 2 time: ____________

Trial 3 time: ____________

Average time: ____________

Use of ambulation device: **Y** **N**
if yes circle which was used

Cane
Walker
Crutches
AFO
Other ____________

Appendix J:

PEDI FORM

MOBILITY DOMAIN Place a check corresponding to each item: Item scores: 0 = unable; 1 = capable

A. Toilet Transfers (0 1)

1. Sits if supported by equipment or caregiver
2. Sits unsupported on toilet or potty chair
3. Gets on and off low toilet or potty
4. Gets on and off adult-sized toilet
5. Gets on and off toilet, not needing own arms

B. Chair/Wheelchair Transfers (0 1)

6. Sits if supported by equipment or caregiver
7. Sits unsupported on chair or bench
8. Gets on and off low chair or furniture
9. Gets in and out of adult-sized chair/wheelchair
10. Gets in and out of chair, not needing own arms

C. Car Transfers (0 1)

11. Moves in car; scoots on seat or gets in and out of car seat
12. Gets in and out of car with little assistance or instruction
13. Gets in and out of car with no assistance or instruction
14. Manages seat belt or chair restraint
15. Gets in and out of car and opens and closes car door

D. Bed Mobility/Transfers (0 1)

16. Raises to sitting position in bed or crib
17. Comes to sit at edge of bed; lies down from sitting at edge of bed
18. Gets in and out of own bed
19. Gets in and out of own bed, not needing own arms

E. Tub Transfers (0 1)

20. Sits if supported by equipment or caregiver in a tub or sink
21. Sits unsupported and moves in tub
22. Climbs or scoots in and out of tub
23. Sits down and stands up from inside tub
24. Steps / transfers into and out of an adult-sized tub

F. Indoor Locomotion Methods (Score = 1 if mastered) (0 1)

25. Rolls, scoots, crawls, or creeps on floor
26. Walks, but holds onto furniture, walls, caregivers or uses devices for support
27. Walks without support

G. Indoor Locomotion: Distance/Speed (Score = 1 if mastered) (0 1)

28. Moves within a room but with difficulty (falls; slow for age)
29. Moves within a room with no difficulty
30. Moves between rooms but with difficulty (falls; slow for age)
31. Moves between rooms with no difficulty
32. Moves indoors 50 feet; opens and closes inside and outside doors

H. Indoor Locomotion: Pulls/Carries Objects (0 1)

33. Changes physical location purposefully
34. Moves objects along floor
35. Carries objects small enough to be held in one hand
36. Carries objects large enough to require two hands
37. Carries fragile or spillable objects

I. Outdoor Locomotion: Methods (0 1)

38. Walks, but holds onto objects, caregiver, or devices for support
39. Walks without support

J. Outdoor Locomotion: Distance/Speed (Score = 1 if mastered) (0 1)

40. Moves 10-50 feet (1-5 car lengths)
41. Moves 50-100 feet (5-10 car lengths)
42. Moves 100-150 feet (35-50 yards)
43. Moves 150 feet and longer, but with difficulty (stumbles; slow for age)
44. Moves 150 feet and longer with no difficulty

K. Outdoor Locomotion: Surfaces (0 1)

45. Level surfaces (smooth sidewalks, driveways)
46. Slightly uneven surfaces (cracked pavement)
47. Rough, uneven surfaces (lawns, gravel driveway)
48. Up and down incline or ramps
49. Up and down curbs

L. Upstairs (Score = 1 if child has previously mastered skill) (0 1)

50. Scoots or crawls up partial flight (1-11 steps)
51. Scoots or crawls up full flight (12-15 steps)
52. Walks up partial flight
53. Walks up full flight, but with difficulty (slow for age)
54. Walks up entire flight with no difficulty

M. Downstairs (Score = 1 if child has previously mastered skill) (0 1)

55. Scoots or crawls down partial flight (1-11 steps)
56. Scoots or crawls down full flight (12-15 steps)
57. Walks down partial flight
58. Walks down full flight, but with difficulty (slow for age)
59. Walks down full flight with no difficulty

MOBILITY DOMAIN SUM

PLEASE BE SURE YOU HAVE ANSWERED ALL ITEMS.

SUBJECT NUMBER: ___________

Appendix K:

VERBAL DIRECTIONS FOR THE TUG

When I say GO I want you to stand up, walk to the cone, go around the cone, walk back to the chair and sit down.

Appendix L:

Photocopy Permission

March 11, 1999

Ms. Cathy Ruprecht
560 Cherry Lane
Holland, Michigan 49424

Dear Ms. Ruprecht:

This letter grants permission for you and your research partners (Ms. Christina Rook and Ms. Susan Carman) to photocopy the mobility domain of the PEDI for inclusion in the bound copies of your research project results *(Validation of the "Timed Up and Go")*.

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Best of luck to you and your partners in this project and in future endeavors, and thank you for including the PEDI in your research.

We would be very grateful if you would send us a copy of your research when it is complete.

Sincerely,

Pamela Bachorz, MS
Manager, Center for Rehabilitation Effectiveness

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