International Journal of Physiotherapy and Research,
Int J Physiother Res 2021, Vol 9[redacted]
DOI: https://dx.do[redacted]

Original Research Article

Relationship between modified TUG and WeeFIM in children with cerebral palsy

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ABSTRACT

Background: Cerebral Palsy (CP) refers to permanent, mutable motor development disorders stemming from a primary brain lesion, leading to secondary musculoskeletal alterations, and limitation of activities of daily living. Motor impairment is the main manifestation in children with CP, and it has consequent effects on the biomechanics of the body. The WeeFIM is a short and quick to administer assessment of functional outcome in paediatric rehabilitation. The modified Timed Up and Go test (mTUG) was designed for children with Cerebral Palsy and assesses mobility and requires both static and dynamic balance.

Context and Purpose: Determining if a relationship exists between functional mobility and level of functional independence in daily activities will help to design treatment programs which target improvement in functional mobility in order to improve functional independence in children with Cerebral Palsy. The studies done correlating functional balance and functional performance in children with CP have largely yielded inconclusive results. Hence this study was designed with the aim of finding if a relationship exists between functional mobility measured by mTUG and functional independence measured by WeeFIM in children with CP.

Methods: It was a correlation study conducted on 20 children with spastic cerebral palsy from different CP centers in and around Mangalore. Participants were evaluated using modified TUG and WeeFIM scales and the scores tabulated and subjected to statistical analysis to determine if there is a relationship exists between mTUG and WeeFIM.

Results: When the measured variables were correlated with each other using Pearson's correlation it was found that the Pearson's correlation coefficient was - .470, indicating a moderate negative correlation between the mTUG and WeeFIMscores.

Conclusion: There exists a positive relationship between functional mobility and functional independence in children with CP. Improving mobility in children with CP can help them to attain better functional independence.

KEY WORD: Cerebral Palsy, GMFC, mTUG, WeeFIM.

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Access this Article online	Journal Information
Quick Response code	**International Journal of Physiotherapy and Research** ISSN (E) 2321-1822 | ISSN (P) 2321-8975 **https://www.ijmhr.org/ijpr.html** **DOI-Prefix:** https://dx.doi.org/10.16965/ijpr
DOI: 10.16965/ijpr.2021.171	**Article Information** Received: 18 Jul 2021 | Accepted: 13 Sep 2021 Peer Review: 19 Jul 2021 | Published (O): 11 Oct 2021 Revised: 02 Sep 2021 | Published (P): 11 Oct 2021

BACKGROUND

Cerebral palsy (CP) refers to permanent, mutable motor development disorders stemming from a primary brain lesion, leading to secondary musculoskeletal alterations, and limitation of activities of daily living [1]. Cerebral palsy presents a conglomerate of complexities [2]. Dr.Bobath elaborates that "the lesion affects the immature brain and interferes with the maturation of the central nervous system, which has specific consequences in terms of the type of cerebral palsy which develops, its diagnosis, assessment and treatment" [3].

Among the activities of daily living (ADL) in children with cerebral palsy, most patients commonly require assistance with dressing, washing, and eating [4]. If children with cerebral palsy are unable to perform these basic activities due to physical challenges, then it becomes difficult for them to receive positive feedback. These can lead to psychological along with physical problems, as well as isolation from the rest of society [5].

Mobility is important for overall health, well-being and independence. Children with CP have variable but significant disruptions in the family life, health maintenance, public life and recreational, leisure and sport activities and most are associated with locomotion capabilities. From infancy to adulthood, physical therapy goals for people with CP should focus on the promotion of participation in their specific personal and environmental contexts by maximizing the activity allowed by impairments and compensating for activity limitations when necessary. Achievement of gross motor skills including standing, walking, running and jumping requires the promotion and maintenance of functional postures and movement and maintenance of optimal levels of fitness and overall health.

In CP although the brain lesion is static, progressive musculoskeletal impairment is seen in most children [6-8]. Physical therapists play an important role on the team of professionals who work with children with CP and their families. They offer choices and advice and provide interventions to promote development of optimal functional abilities, facilitate independence and participation in all aspects of life, and avoid secondary impairments. The support given during infancy, childhood, and adolescence can have an impact on functioning and quality of life in adulthood. In a nutshell, all these physical therapies will help them to have a better Quality Of Life.

The Gross Motor Functional Classification System (GMFC) is a 5 level clinical classification system which looks at movements such as sitting, walking and use of mobility devices. For CP it has been widely used internationally for clinical, research and administrative purposes [9]. Child's level of independence in activities and participation in daily life are assessed with (WeeFIM [10]) which was adapted from the adult Functional Independence Measure (FIM). It includes 18 items with a 20-minute administration time. The Modified Timed Up and Go test (mTUG) was designed for children with cerebral palsy and was seen to be more user friendly for them. The mTUG is a tool used to assess a person's mobility and requires both static and dynamic balance [11].

Functional mobility and functional independence are important parameters in assessment and treatment of children with Cerebral Palsy. Determining if a relationship exists between these two parameters will help to design treatment programs which target improvement in functional mobility in order to improve functional independence in children with Cerebral Palsy. Through the present study, we aim to find out if a relationship exists between functional mobility assessed by mTUG and activities of daily living function measured by WeeFIM in children with Cerebral Palsy.

METHODOLOGY

The study was conducted among the children with spastic CP screened by pediatrician at tertiary care hospitals and CP centres in and around Mangalore. It was a correlational study with purposive sampling completed over period of 1 year [1st Feb 2016-1st Feb 2017]. Ethical clearance was obtained from the central ethical committee of the institution. A total of 32 children both male and female between the age 6-12 years were screened from the special schools in and around Mangaluru for the study,

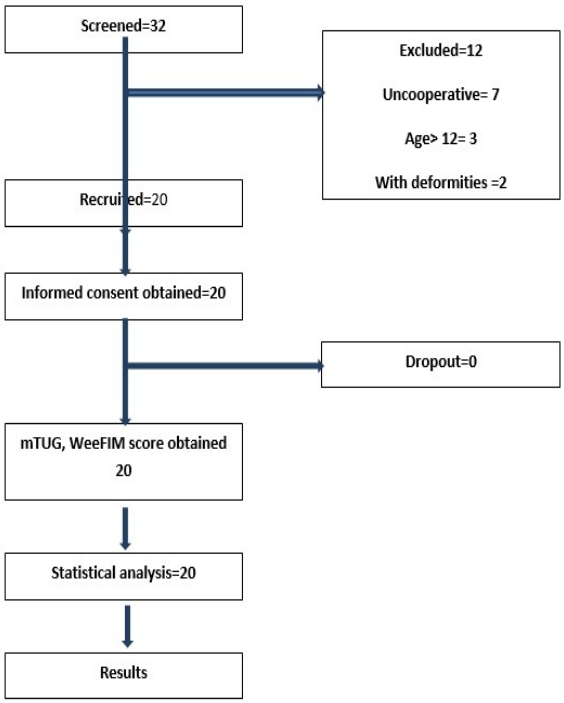
their teachers were explained about the study and twenty children who fulfilled the inclusion and exclusion criteria were included in the study. Written informed consent was obtained from the parents of the participants. We included children those who were diagnosed with spastic CP by a pediatrician and graded as I, II, III in the Gross Motor Function Classification. Children were excluded if they had any orthopedic deformities with indication for surgery, were uncooperative or were not able to follow instructions.

The assessments were carried out by the principal investigator (PB, a physical therapist) with the help of an assistant, who was a student physical therapist. All assessments were carried out on the same day for each subject in a rehabilitation set-up with the child's class teachers present.

The mTUG test began with the subject sitting on a stable stool, which was selected according to the height of subjects. The stool was positioned such that it would not move when the subject moved from sitting to standing. Subject was seated with feet flat on the floor in such a way that hip and knee remained in 90° of flexion. A marking tape was used to stick star mark on the wall at a distance of 3 m from the chair. A concrete task was used, wherein the subject was asked to touch the target (star) on the wall, instead of the more abstract verbal instructions of the standard TUG test.

The following instructions were delivered to the subject slowly and clearly: "This test is to see how you can stand up, walk, and touch the star, then come back to sit down. The stopwatch (of cell phone) is to time you." Subjects wore their regular footwear or orthosis, and were allowed to use walking aid, but were not allowed to be assisted by another person during the performance of the test. There was no time limit for the performance of the test, and they may stop and take rest (but not sit down) if they needed to do so. Instructions given were "After I say 'go,' stand up, walk up to and touch the star, and then come back and sit down. Remember to wait until I say 'go.' This is not a race; you must walk and not run, and I will time you. Don't forget to touch the star, come back and sit down." Timing was started as the child left the seat, rather than on the instruction "go" and stopped as the subject's bottom touched the seat, in order to measure "movement time" only. A practice trial was given to the subject. Thereafter, the test was conducted in two non-consecutive days and respective time was recorded. The time was measured in seconds. The mean of two values was documented and used for analysis. The investigator sat on a chair in clear view of the subject. Subjects were tested in small groups. Every completed TUG test was scored and noted. The same investigator conducted all the testing procedures for the study. After this by direct interview with the respective class teacher's functional independence was measured by scoring WeeFIM score sheet, in which their self-care, sphincter control, transfers, locomotion, communication and social cognition was measured. WeeFIM includes 18 items with a 20-minute administration time. The WeeFIM was adapted from the adult FIM retaining the same structure as the original scale. A 7-level ordinal rating system ranging from 7 (complete in dependence) to 1 (total assistance), is used to score performance in each item. This consists of two dimensions: motor and cognitive. Its purpose is to an evaluative measure of disability using a minimal essential data set that is discipline free and is designed to track outcomes across clinical settings. All the collected data was subjected to statistical analysis.

Figure 1: Progress of participants through the study.



RESULTS

The WeeFIM total score and sub-scores of self-care, mobility and cognition along with mTUG scores were analyzed statistically. Descriptive statistics were used to describe the age and gender characteristics of the participants. The Pearsons correlation coefficient was computed to study the correlation between mTUG scores and WeeFIM total scores and between the mTUG scores and the self-care, mobility and cognition sub-scores of WeeFIM. All data were analyzed using SPSS 16.0 version.

Table 1: Descriptive statistics for age, WeeFIM and mTUG scores.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	20	66	148	116.55	28.239
mTUG	20	5	108	34.1	27.268
WeeFIM	20	25	116	75.95	27.136
Valid N (list wise)	20				

Table 2: Pearson correlation between mTUG and WeeFIM, Selfcare, Mobility, Cognition.

Correlations					
		WeeFIM	Selfcare	Mobility	Cognition
mTUG	Pearson Correlation	-0.581	-0.533	-0.705	-0.155
	Sig. (2-tailed)	0.007	0.015	0.001	0.515
	N	20	20	20	20

A moderate negative correlation was found between mTUG and WeeFIM scores and mTUG and self-care component of WeeFIM. There was a strong negative linear relationship between mTUG and mobility in WeeFIM and also a non-linear relationship between mTUG and cognitive area in WeeFIM.

DISCUSSION

The present study was carried out to find out the correlation between, functional mobility and functional independence using mTUG and WeeFIM respectively in children with cerebral palsy. The results showed that there was a moderate negative correlation between mTUG and WeeFIM i.e., when the time taken with mTUG is less it shows a better functional independence score in the sample studied. There was also a correlation between mTUG scores and the three different subscales of the WeeFIM, namely, cognition, self-care and mobility.

Cerebral palsy is considered a neurological disorder caused by a non-progressive brain injury or malformation that occurs while the child's brain is under development. Cerebral palsy primarily affects body movement and muscle coordination. While cerebral Palsy is a blanket term commonly referred to as "CP" and described by loss or impairment of motor function, Cerebral palsy is actually caused by brain damage. The brain damage is caused by brain injury or abnormal development of the brain that occurs while a child's brain is still developing — before birth, during birth, or immediately after birth. Cerebral Palsy affects body movement, muscle control, muscle coordination, muscle tone, reflex, posture and balance. It can also impact fine motor skills, gross motor skills and oral motor functioning. Current research suggests the majority of Cerebral Palsy cases result from abnormal brain development or brain injury prior to birth or during labor and delivery.

Functional mobility is defined as the ability of people to move around in the environment in order to participate in activation of daily living and move from place to place. For performing normal activities of daily living, having a better functional mobility is very essential. Zaino CA, 2004 et al [12] had done a study to support the use of TUG [Timed Up and Go] and TUDS [Timed Up and Down Stairs] to detect changes in functional mobility in children with mild cerebral palsy. As our study shows a relationship between functional mobility and functional independence, this point outs that if a child with cerebral palsy have a good mobility component he can be more active in personal as well as social life, so that he can have an improved life style with less dependence on others. In mTUG the procedure is same as that of TUG but the subject can take rest in between and can also use their supporting aids. Also a star will be there on the wall as

target to go touch and coming back. Sue-Mae Gan et al, 2008 [13] in their study had concluded that TUG test had excellent test-retest reliability in their study on the intra-rater reliability of three functional balance measures, including TUG test in children with CP within GMFCS level of I–IV. Galea et al. (2005) [14] also reported that reliability of the TUG test was high in normal children and physically disabled.

Functional independence is defined as the functional status of a person while doing his activities of daily living which requires a better mobility. The present study it was found that a moderate correlation existed between mTUG scores and self-care and cognition subscales of WeeFIM. A strong correlation existed between mobility subscale of WeeFIM and mTUG scores. Here we are more focusing on the self-care, mobility and cognition which are very essential for a better quality of life. Oeffinger D, et al [2017] [15] in their study clearly says that WeeFIM Self-care and Mobility have a direct relationship with GMFCS levels I- III. Tur BS, et al in 2009 [16] concluded in their study done on Turkish children with cerebral palsy as the WeeFIM is a reliable and valid instrument for evaluating their functional status. There are studies showing school-aged cerebral palsy children who were more functionally dependent were found to have worse quality of life. The WeeFIM measures the impact of developmental strengths and difficulties on independence at home, in school, and in the community. This allows the rehabilitation team to prioritize interventions for enhancing comprehensive functional outcomes and supporting families. Ring et al. (2007) [17] & Murrell (1999) [18] defined QOL as dynamic, multi-dimensional person-centered construct which includes an assessment of subjective well-being, determinants of which are age-specific, developmentally derived and experiential. Varni JW et al (2005) [19] have reported that children with cerebral palsy and their carers have impaired health related QOL. There is fair correlation between the caregiver questionnaire (CQ) and Wee-FIM. CQ may be a more specific measure of HR-QOL as it reflects the impact of the child's condition on the caregiver.

Our statistics gives a clear picture that only the mobility component of WeeFIM has a strong relation with mTUG. In case of cognition, it is weakly related with functional mobility. And with self-care it is moderately related with mTUG.

There are some literatures which compare functional mobility and functional independence and proved that they are correlated. The present study also aims at comparing the same using two scales mTUG and WeeFIM and found a negative downhill relationship between them. Lyon NR et al in 1997 [20] collected data for 205 children ranging in age from 11 to 87 months. All children had a medical diagnosis of disability and were receiving rehabilitative educational intervention or follow intervention or follow along services including neurodevelopmental surveillance and found that WeeFIM scores obtained were consistent across raters and time. Gan SM, et al 2008 [21] in their concluded that functional balance measures BBS, TUG, FRT are simple, valid, and reliable for examining children with cerebral palsy and are thus suitable for clinical practice. Sanjivani Dhote et al 2012 [22] in their study shows that Modified timed up and go is a reliable test to use in children with cerebral palsy. The biggest challenge that these children with cerebral palsy encounter is their inability to independently perform ADL. To enhance the performance of these ADL, it would be necessary to examine the relationship between mTUG and WeeFIM for potential use in subsequent treatments.

The association found between functional mobility and functional independence in children with CP in the present study shows how the functional independence of the children with CP can be enhanced by treatment strategies which enhance functional mobility. Therefore, mobility training should be an integral part of treatment of children with CP. And in this way if we make them more independent, they can do their activities of daily living in a better way. By making them more independent their quality of life will also be improved. Further experimental studies can explore how mobility training can influence functional status in children with CP.

The present study had limitations of small sample size with unequal number of boys and

girls, and they were not analyzed separately. They were selected from a small geographical area and their respective class teachers were interviewed instead of their parents. Further studies should be undertaken which addresses these limitations.

CONCLUSION

Functional independence of children with CP depends on their level of functional mobility. Further studies are still necessary to find out how mobility training can influence functional status in children with CP.

ABBREVATIONS

CP: Cerebral Palsy
mTUG: Modified Timed Up and Go
WeeFIM: Functional Independence Measure for children
GMFCS: Gross Motor Function Classification System

Conflicts of interest: **None**

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How to cite this article: Praveen Baby, Haripriya S, Remya N, Manju Unnikrishnan. Relationship between modified TUG and WeeFIM in children with cerebral palsy. Int J Physiother Res 2021;9(5):4001-4007. **DOI:** 10.16965/ijpr.2021.171