

Research Article

Test-retest reliability of six minute walk test in spastic ambulatory children with cerebral palsy

Rutvee P. Vinchhi*, Shraddha Diwan, Sweetty Shah, Neeta Vyas

S.B.B. College of Physiotherapy, V.S. General Hospital, Ellis Bridge, Ahmedabad-380006, Gujarat, India

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*Correspondence:

Dr. Rutvee P. Vinchhi,

E-mail: dr.rutvee27@gmail.com

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ABSTRACT

Background: The Six Minute Walk Test (6MWT) can provide valuable clinical information regarding gait abilities as well as can give an idea about functional ability and outcome in individuals. However, little information available on 6MWT used in cerebral palsy. Hence the purpose of present study was to assess the test-retest reliability of 6MWT in children with ambulatory spastic cerebral palsy.

Methods: It was a cross sectional observational study conducted in paediatric neurorehabilitation department of a physiotherapy college, with convenient sample of 18 children with cerebral palsy of 4 - 14 years of age, with GMFCS level I to III. Subject performed 6MWT twice under controlled conditions with 30 minutes rest in between the tests.

Results: Test-retest reliability was analyzed using the distance walked during first and the second sections. The documented data were analyzed for test-retest reliability by using spearman correlation test and it was highly reliable ($r = 0.955$ and $P < 0.0001$).

Conclusion: The six minute walk test is highly reliable to be used in children with spastic ambulatory cerebral palsy, as an outcome measure.

Keywords: Cerebral palsy, Test-retest reliability, Six minute walk test

INTRODUCTION

Cerebral palsy is “a group of permanent disorders of development of movement and posture, causing activity limitation, which is attributed to non-progressive disturbances occurring in developing fetal or infant brain”.¹ Common impairments are abnormal tone, muscle imbalances, movement and posture. Of these motor deficits mainly have detrimental effect on speed, distance parameters and quality of gait (i.e., ambulation) in cerebral palsy.^{1,2} Spastic Diplegia is the commonest form of cerebral palsy in which there is more involvement of lower limbs than upper limbs.^{3,4} 6MWT assesses the objective functional capacity by making a person walk for defined period of time and measuring distance

covered and it is better than the self-report for assessing functional capacity.⁵ A recent review of functional walking tests concluded that “the 6MWT is easy to administer, better tolerated, and more reflective of activities of daily living than the other walk tests”.⁶ However little information available about reliability and usability of this test in cerebral palsy population. Hence the purpose of this study was to assess test-retest reliability of 6MWT in spastic ambulatory cerebral palsy children.

METHODS

This was a cross sectional study to assess test-retest reliability (after 30 minutes) of 6 minute walk distance in

children with spastic cerebral palsy who are ambulatory. The study was conducted in paediatric neurorehabilitation department of a physiotherapy college. Total of 18 subjects were taken for the study.

The subjects included in this study were fulfilling the following criteria: children diagnosed with spastic CP, ages from 4 to 14 years, ambulatory (GMFCS level I, II, III), and who were able to follow the basic commands.

Those with cognitive deficits, other type of CP (athetoid, hypotonic, ataxic, other neuro-developmental disorders like autism, etc.), other comorbid condition, any orthopaedic intervention in lower extremity in last 6 months, Botox given in last 3 months were excluded.

Main outcome measure was - six minute walk test: Testing was conducted in paediatric neurology rehabilitation department with child's parent or legal caregiver present. The test was begun with taking the resting vitals (i.e., blood pressure, pulse rate, respiratory rate, SpO₂). The test and procedure was explained to the parents and to subjects.

The following instructions were delivered to the subject slowly and clearly: 'This test is to see how much distance you can cover in six minutes. The stop watch is used to time you.' Subjects wore their regular footwear, orthosis, and are allowed to use walking aid, but were not allowed to be assisted by another person during performance. Therapist was continuously walking behind the child to protect, guide, and motivate to walk. They were allowed to take rest if they required. Instructions given were: "After I say 'go', start walking from one mark to another mark till I say 'stop'. This is not the race, but you have to walk as fast as possible and if you feel any inconvenience you can tell to me. After completing the test immediately after, after one minute, and after three minutes post-test vitals were taken. This was mainly for safety purpose for confirming normal recovery. The practice trial is not required for the test. The encouragement for walking was provided in accordance to improve the performance.⁷

After taking the test subjects were asked to take rest for 30 minutes and then the second test was taken on the same day.

Setting up the test area

- Determine a path free from obstruction at least 20 meters of length.
- Place the marks at starting and ending points of the path.

Mark off a 20 meter distance using the tape.

Start the test

- Speak slowly and clearly

- Inform parents and participant about sequence and outcome.
- When I say go, start walking as fast as you can, from one to another mark till I say stop, i.e., for 6 minutes. I will be timing you using the stop watch. Ask the child to repeat the instructions to make sure that they understood the instructions.

Gross motor function classification system

The GMFCS was developed by Robert Palisano, Peter Rosenbaum, Stephen Walter, Dianne Russell, Ellen Wood, and Barbara Galuppi in the year 1997 at the CanChild center for childhood disability research. The GMFCS for CP is based on self-initiated movement with particular emphasis on sitting (trunk control) and walking. GMFCS features a 5-level ordinal scale which reflects, in a decreasing order, the level of independence and functionality of children with CP. The focus is on determining which level best represents the child's present abilities and limitation in motor function. Emphasis is on the child's usual performance at home, school, and community settings. It is therefore important to classify on ordinary performance (not best capacity) and not to include judgments about prognosis. The purpose is to classify a child's present gross motor function, not to judge the quality of movement or potential for improvement. Table 1 shows general headings of each level.

Table 1: General headings for each level.

Level	
Level I	Walks without limitations
Level II	Walks with limitations
Level III	Walks using a hand held mobility device
Level IV	Self-mobility with limitations; may use powered mobility
Level V	Transported in a manual wheel chair

Subjects were selected on bases of selection criteria. The purpose of the study was explained to the subjects and to their parents or guardian. Written informed consent of parents & oral consent of child was taken before study.

Performances of the subject were observed on 6MWT twice with 30 minutes rest period in-between and distance covered was measured. For analyzing reliability the distance walked for two times were considered.

Data from all the subjects based on performance of 6 minute walk distance for first (T1) and second time (T2) were taken for analysis. The data collected were entered in computer database and analyzed with SPSS statistical package (version 16.0) spearman's correlation test was used to correlate value of T1 and T2 with level of significance kept at 5%.

RESULTS

Out of 18 subjects 15 were males and 3 were females. Out of 18, 2 were spastic hemiplegic cerebral palsy and 16 were spastic diplegic cerebral palsy. Out of 18, 8 were of GMFCS level I, 6 were of GMFCS level II, and 4 were of GMFCS level III. As the data was not normally distributed the nonparametric test was applied. Correlation was done with spearman's correlation test and that gives highly significant reliability, with r value 0.955 and P value <0.0001.

DISCUSSION

The present study was carried out with aim to find the test retest reliability of six minute walk test in children with ambulatory spastic cerebral palsy. The result of present study indicates that test retest reliability was found to be excellent in cerebral palsy children of age group 4 - 14 years.

The result of our study is in accordance with Patricia Thompson et al, who studied the test retest reliability of 10 meter fast walk test and 6 minute walk test in ambulatory school aged children with cerebral palsy, including all type of cerebral palsy and found ICC of 0.98 for all participants, i.e., excellent reliability.

A. M. Li et al., studied the "six minute walk test in healthy children: reliability and validity" and concluded that ICC was 0.94 and so is reliable for assessing endurance and exercise tolerance.

Previous studies involving children using the 6MWT were performed in groups of diseased patients and did not include cerebral palsy children, 23 children with Cystic Fibrosis (CF) were studied and found the 6MWT to be valid and useful in assessing the exercise tolerance and endurance of children with mild-to-moderate symptoms of CF.⁸⁻¹⁰

Significant correlations was reported between 6MWD and measures of mobility, including standing balance, chair stands, and gait speed, in 86 people at or over the age of 65 years.¹¹

The 2- or 6-min walk test is used to measure the maximum distance that a person can walk over that time interval, and is commonly used in the assessment of cardiovascular or pulmonary disease. It has been used to assess outcome and mobility in individuals with stroke, head injury and Parkinson's disease¹⁸ and has been found to be reliable.¹²

Moreover 6 min walk test is self-paced speed walk test and submaximal walk test where patient is asked to walk at his own comfortable speed that he can maintain for 6 minute thus 6 min walk test is found to be comfortable for the subjects and subjects walks similar distance at their own pace easily. Thus 6 min walk test shows

excellent test retest reliability in children with cerebral palsy.

This is consistent with Mossenberg KA who studied reliability of timed walk test in person with acquired brain injury found ICC to be highly reliable for assessing the endurance of the subjects.

CONCLUSION

The six minute walk test was found to be highly reliable for children with ambulatory spastic cerebral palsy, so it should be used as an outcome measure to assess functional ability, and cardiopulmonary endurance in children with cerebral palsy. Small sample size, no blinding and other factors like pain, BMI, medications & mood of the child was not taken into consideration.

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