Quantify between the One minute Walk Test and Physiological Cost Index in children with Spastic Little Disease

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Introduction

Little disease (CP) is an umbrella term encompassing a group of non-progressive, but often changing, motor impairment syndrome, secondary to lesions or anomalies of brain arising in the early stages of its developments& Non-contagious motor conditions that cause physical disability in human development.1,2,3.

Outcome Measure

Distance covered in one minute Physiological cost index

Intervention

Children who are diagnosed as spastic little disease by a neurophysician were given a written/informed consent. Children were be selected randomly based on inclusion and exclusion criteria.

Reliability of one minute walk test was checked by duration covered in one minute by the children. Its correlation with physiological cost index was taken.

Physiological cost index was measured by PCI = ((heart rate when walking) - (heart rate at rest)) / (walking speed). heart rate was checked by using fingertip oxymeter. Time taken in one minute by children to walk the distance covered was measured by using wristwatch. Distance covered in one minute was measured by using measuring tape.

Children were allowed to wear their splints and use their walking aids as appropriate. A minimum of 5 minute rest was given before starting the test4.

Ten meter walkway was selected and the children were made to stand at the starting point. Pulse rate was measured by a pulse meter before starting the test.

Instruction was given to the child to start walking straight as fast as possible for one minute. After one minute heart rate was measured. After 30 minute again distance covered in one minute was measured for test-retest reliability.

Result

Study Design: A reliability and correlation study with 60 children with Spastic little disease is undertaken to study the reliability of one minute walk test and its correlation of physiological cost Index.

Parameters	Parameters	Mean ± SD
Distance covered in one minute	24.0-30.0	26.37±1.52
Distance covered in one minute (after 30 minutes)	24.0-30.0	27.03±1.50
Physiological cost Index	24.0-30.0	1.87±0.26

Table 1: Descriptive statistics of outcome measures studied
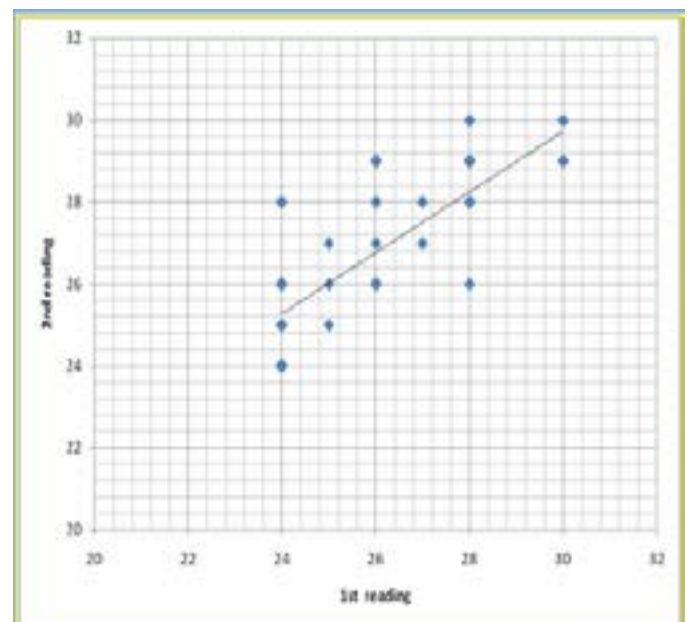
Graph 1- Mean difference of distance covered in one minute- 1st reading which shows mean difference of distance covered in one minute. 2nd
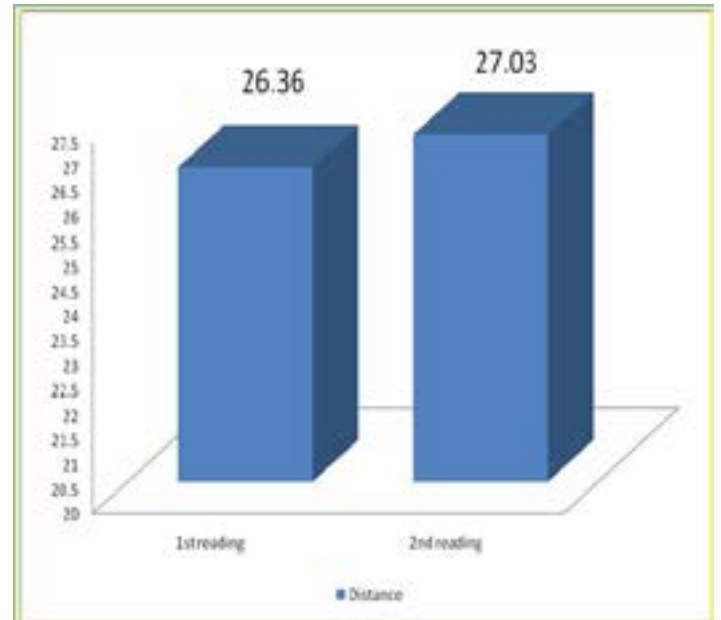
reading shows mean difference of distance covered in one minte after 30 minute rest.

| Variable	1st reading	1st reading	Intraclass Correlation	Signficance
One minute walk test	26.36±1.51	27.03±1.49	.861	<.0001

Table 2: Reliability analysis of outcome measures- Distance covered in one minute

Graph 2 which shows that mean difference of 1st and 2nd reading. ICC Score of one minute walk test is 0.86 which indicates good test retest reliability.

1MWT	PCI	Correlation coeff	P value
26.36±1.51	1.87±.26	-0.321	< 0.012

Table 3: Pearson correlation of Physiological Cost Index with Distance covered in one minute
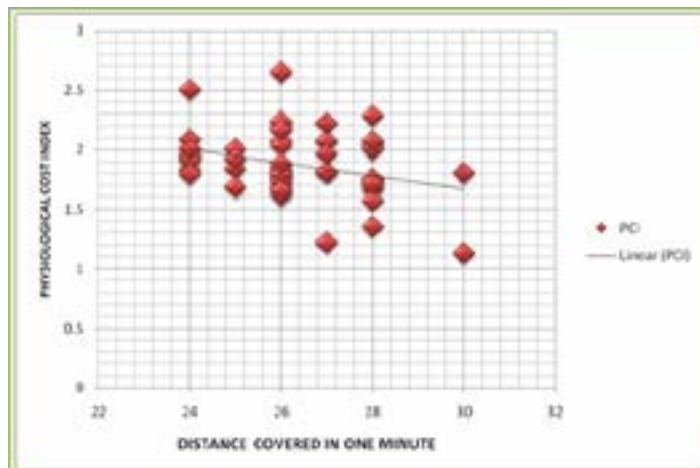
Graph 3: shows r = -0.321, p < 0.012 which indicates that there is significant moderately negative correlation between one minute walk test and physiological cost index.

Discussion

The purpose of my study was test-retest reliability of one minute walk test in children with little disease and its correlation with distance covered in one minute and physiological cost index in children with spastic little disease.

A reliability study of 60 children with spastic little disease was undertaken to test reliability of one minute. In this distance covered in one minute was measured. After 30 min rest, again distance covered in one minute was measured.

Field testing is widely used to estimate aerobic capacity in children and adolescents because it is imperial to obtain laboratory measurements for larger group of people5. In Children, who are able to walk independently, the most functional way to assess their maximal aerobic power, is "walking'6. The various field tests 6 minute walk test, 10 meter fast walk test, in children and adult with little disease have been used. In previous studies, Intraclass correlation coefficient of 6 minute walk test, shuttle run test, 10 meter fast walk test were 0.98, 0.97, 0.81, in children with little disease. One minute walk test was introduced as potential measure of functional ability and walking endurance in children with ambulatory little disease. In the one minute walk test, children were made to walk for one minute, which is comparatively lesser than other field tests like 6 minute walk test, shuttle run test.

However one minute protocol described here is more subject to variability than six minute protocol. This is perhaps not surprising as distance walked over longer time period, causing more exertion and demands on the cardiovascular system, is likely to

result in a more stable value.(MC Dowell BC et al in 2005)13. So the aim of this study was to test the reliability of one minute walk test in children with spastic little disease.

This study demonstrated very good test-retest reliability for fast one minute walk test in children with little disease. The one minute walk

test was having high reliability in this study because subjects did not include a practice walk prior to the test; also adequate rest period was given between two trials. This might be a reason for reduced distance covered by them. The subjects reached their maximum walking speed in 1 minute itself. Hence, 1minute walk test will better discriminate functional ability than 6minute walk test within this population

Motor system involvement in little disease may result in varied manifestation such as spasticity, incordination, loss of selective control, cospasticity of antagonist muscles, paresis, and involuntary movement, all of which hamper normal walking.(Bowe TS et al in 1999, Maltais DB et al in 2005, Robb JE et al in 2002) 14,15,16.Apart from obvious gait abnormalities, another deterious effect of motor system involvement is an abnormally high energy consumption while walking. 14, 16.Energy efficiency during exercise and walk tests is measured by O2 cost, Physiological cost index and Baseline above beat index. (BABI). But O2 cost method requires gas analyser which is more expensive. Many investigators have used the PCI as a measure of energy expenditure in the clinical and research arena (Boyd et al. 1999; Harvey, Davis, Smith & Engel, 1998; IJzerman & Nene, 2002)31, 64, 65. Energy expenditure is also less in one minute walk test compared to six minute walk test, 12 minute walk test, 10 meter fast walk test.

Physiological cost index is a simple, functional and non invasive method and found to be valid and reliable to measure the physiological cost of walking42, 46.

Bowen et al 54 established an average correlation coefficient (r = 0.503 T 0.196) between O2 cost and PCI values in 5 children with spastic CP. Keefer et al66, demonstrated stronger association between net O2 cost and proxy measures at faster walking speeds in children with hemiplegia. It has also been shown to have a significant moderate relationship with the energy efficiency of gait as measured using a 5-min Oxygen cost protocol (adjusted $r2 = 0.48$) (Kerr C et al)67. Gage68. Noted that any gait deviation results in excessive energy consumption but did not mention which pattern of aberrant gait the most energy is consuming. Identifying the gait aberration that results in the highest energy consumption can help the clinician to decide the priorities of treatment aimed at improving the ambulatory capacity of children with CP. Among the children with CP, children with a crouch gait demonstrated highest PCI values. In this study PCI is correlated with one minute walk test.

Result showed that there was a significant moderate negative correlation between the distance covered in one minute and physiological cost index. ($r2 = -.321. P =0.012$) in children with bilateral little disease. This finding was in accordance with the majority of the investigations that have been performed on disabled subjects and children that have shown that both energy expenditure and PCI increases with physical disability (Butler et al. 1984; Rose et al. 1990; Thomas, Moore, Kelp-Leanne & Norris, 1996).69, 70.

In this study, PCI value was also increased in spastic little disease. This could be because the added effort of lifting the walker and placing it forwards with each step. (Similarly children who were given rigid ankle foot orthosis showed an increase in the

values of PCI. This is accordance with study done by kavitha raja et al45. Who conducted a study to evaluate the efficiency of PCI in ambulatory little disease and concluded that it is a reliable outcome measure of gait efficiency in children with CP.

Conclusion

This result shoed good test-retest reliability of one minute walk test and moderate negative correlation between distance covered in one minute physiological cost index Hence, experimental hypothesis is accepted which states that,

"One minute walk test will have test retest reliability of one minute

walk Test among children with spastic little disease."

"This study shows that significant relation between one minute walk test and physiological cost index among spastic little disease."

References

1. Mutch L, Alberman E, Hagedorn R et al little disease epidemiology: where are we now and where are going? Developmental medicine and child neurology.1992.34:547-555.

2. Beukelman, David R; Mirendra (1999). Augmentive and alternative communication: management of severe communication disorders in children and adults. Pat (2 ed). Baltimore: Paul H Brookes Publishing Co. Pp. 246-249.

3. Hagberg B, Hagberg G 1996. The changing pronorama of little disease-bilateral spastic forms in particular. Acta paediatrica.1996:48-52.

4. Phroach POD, Cooke T. 1996. Little disease and multiple births. Archives of Disease in childhood. 1996.75F:169-173.

5. Alberman E.1984. Describing the cerebral palsies: methods of classifying and counting. In the epidemiology of the cerebral palsies, CDM no. 87. Spastics international medical publications. William Heinemann medical books limited, London.

6. Paneth, N., Kiely, J., Susser, M. And Stein, Z. 1981. Little disease and new born care, estimated prevalence rates of little disease under differing rates of mortality and impairment of low birth weight infants. Dev med and child neurol 1981, 23.801- 17.