Efficacy of Dual Task Training to Improve Functional Gait Performance in Idiopathic Parkinson's disease Subjects

Pandian Sankara Kumara[1], Tamilvanan M[2], Karthikeyan Parangimalai Diwakar[3]

[1]Annai Velankanni Hospital & College,
Tiruchendur Road, Tirunelveli -627011, Tamil Nadu, India (Senior Physiotherapist)

[2]Masterskill College of nursing and health (Lecturer)
Kota bharu, Kelantan, Malaysia

[3]Allianze university college of Medical Science,
Penang, Malaysia (Lecturer)

Abstract: ***The primary onset of this study is to determine the short and longer term effects of dual task training gait on walking performance when dual tasking in people with Parkinson's disease.. The aim of the study is to analyze the efficacy of dual task training to improve functional gait performance in idiopathic Parkinson's disease subjects. Design and setting: A randomized controlled study design was used to examine the differences in conventional therapeutic exercises and conventional therapeutic exercises with specific external cueing strategies given between two groups. Subjects: A sample of 10 subjects with idiopathic Parkinson's disease was screened using Timed up and go test (TUG Test) and those who scored 24% less was taken for the study .the subjects were of both genders aged between 50-75 years of age with medically stable patients. They were divided into two groups of control and experimental group.the study was done in Masterskill College of nursing and health. Outcome Measurement: Functional gait performance will be measured using the timed up and Go (TUG) test with added motor and cognitive tasks, participants will be asked to walk as quickly as they safely can under all conditions and will be permitted to use their usual gait aid. Results: Data Analysis of the subjects after dual task training led to a greater improvement in functional walking capacity and step length. The average percentage of improvement in timed up and go test is 53%. Conclusion: According to this study Dual task training had improved step length and functional walking capacity in idiopathic Parkinson's disease.***

Key words: Parkinson's disease, TUG test, Functional gait performance.

1. Introduction

Parkinson's disease (PD) is a degenerative disorder of the central nervous system. It results from the death of dopamine – containing cells in the substantia nigra, a region of the mid brain; the cause of cell death is unknown. Early in the course of the disease, the most obvious symptoms are movement related, including shaking, rigidity, slowness of movement and difficulty with walking and gait. Later, cognitive and behavioral problems may arise, with dementia commonly occurring in the advanced stages of the disease [8].

Parkinson's disease is the 2nd most common neurodegenerative disorder after Alzheimer's disease. PD leads to disability and affects quality of life. In addition, it puts considerable emotional stress and economic burden on caregivers.

The spectrum of disease comprises of movement disorders and non motor symptoms like dementia, depression, visual hallucination and autonomic dysfunction [6]**.** Population of elderly Indians has increased from 5.6% (51 million) in 1961 to 7.1% (71 million) in 2001. This increasing life expectancy of Indians, in the last decade, is likely to result in an increase in age related disease like Parkinson & Alzheimer's diseases.

The elderly population and Alzheimer's diseases. The elderly population in developing countries is predicted to increase by 200-280% compared with a mere 30-40% in the developed nations of the world's 580 million elderly (> 60 yrs), 355 million (61%) live in developing countries and, of these, 77 million (22% of total) live in India caring for this increasing elderly population can be challenging as 80% of elderly Indians live in rural areas, 73% are illiterates 60% are women and 60% live below the poverty line.

A growing body of evidence indicates that physical activity can help to protect dopamine cells from early death. Studies reveal that an exercise – related increase in the production of a specific growth factor, glial cell line derived neurotrophic factor (GDNF), takes place in the basal ganglia [5].

A growing body of evidence indicates that physical activity can help to protect dopamine cells from early death. Studies reveal that an exercise – related increase in the production of a specific growth factor, glial cell line derived neurotrophic factor (GDNF), takes place in the basal ganglia [5].

Parkinsonism rats (or) monkeys that run on a treadmill avoid motor impairments and maintain dopamine levels in the brain [9]**.**

Balance activities should promote the dynamic balance needed for functional activities such as reaching and turning in the home environment, pushing or carrying objects, and negotiating unpredictable environments.

Also the time of diagnosis is ideal for clients to begin tai-chi classes. This type of whole body, large scale and purposeful movement can reduce falls in people with Parkinsonism disease [11].

Over 4 million people worldwide are estimated to be diagnosed with Parkinson disease (PD) more than half of community dwelling adults living with PD experience gait disturbances that are associated with increased disease severity, disability, poor quality of life and care giver strain, falls are a common complication of PD, with between 50 and 68% of people with PD falling each year, with most falls reported to occur when walking.

Medications such as levodopa, provide the corner stone of treatment of gait disturbances in PD, become loss effective over timer for some symptoms of PD including gait disturbance internal (or) external cues are used to direct a person's attention to normalize their gait deficits, is effective in augmenting drug therapy to improve gait in the short term. Internal cues involve the person directing their attention to consciously think of improving the deficit.

External cues aim to normalize the gait deficit and often include verbal cues, visual cues (on the floor at the desired step length or auditory uses (e.g. metronome to normalize cadence).

For gait to be functional in daily life both within the community and home, people need to be able to dual task. This could involve thinking when walking or maintaining balance when holding an object. It is well known that performing an added task interferes with postural stability in older adults (termed dual task interference) particularly in those adults with impaired balance.

The primary aim of this study is to determine the short and longer term effects of dual task training gait on walking performance when dual tasking in people with Parkinson's disease.

2. Methodology

A sample of 10 patients with idiopathic Parkinson's disease was screened using Timed up and Go Test (TUG Test) and those who scored 24 % less was taken for the study. Both male and female subjects within the age group 50-75 years and medically stable subjects were taken into this study. Subjects with disorders such as CVA, Dementia, Mood disorders, musculoskeletal and cardiovascular illness and Patients with severe dyskinesia are not included.

Preliminary interview was done with all the subjects. Demographic details and informed consent were obtained. Subjects with score of 24 and less were equally divided into experimental and control groups.

Conventional therapeutic activities were given to control group, where conventional therapeutic activities were given to control group, where conventional plus specific external cueing strategies were given exclusively to the members of experimental group.

2.1 Procedure

After initial neurological examination subjects who met study criteria and agreed to participate and to informed consent were taken from the subject prior to the treatment. The subject's was trained in dual task training in a 12 session program administered for 40-60 minutes each session typically undertaken 3, times per week for 4 weeks. Optimal 'ON' period, often 1 hour post medication.

The dual task gait training programs will aim to improve step length under dual task conditions, when concurrently performing added cognitive (or) motor tasks. Participants will undertake repeated practice of walking aiming to improve step length using external cueing techniques as outlined above, progressing to internal concurrent cueing of appropriate step length.

The gait tasks undertaken will be progressed from simple to more complex tasks as out lined for the single tasks. Variety of added tasks will be progressively integrated into the training Programe Tasks such as listening, speaking, conversing, generation of simple and complex lists, language calculation and motor tasks increasing in complexity.

Progressed to performing increasingly complex cognitive tasks while concurrently walking. Visual spatial planning tasks (eg., tell me how to get from here to reception), response inhibition tasks (e.g. complete the phrase without saying….), or tasks integrating both language and calculation components (e.g. if Saturday is the 8^{th} , what is the date the following Thursday?).

Motor tasks such as carrying and manipulations will also be included as added tasks. As some studies have reported that added cognitive and motor tasks can both impact gait performance in people with PD. These may be combined with cognitive tasks (e.g. getting a certain amount of money out of a wallet when walking).

A weekly guide for progression of task type and difficulty will be used and programs will be individually progressed. On one walking pass, a participant will be asked to concentrate mainly on taking big steps when also performing a counting task. In the reset pass, they will be asked to concentrate mainly on the added task, trying to count as quickly and accurately as possible. Result in better balance during dual task gait conditions in older adults with balance impairment than fixed priority training, so this approach will be gradually introduced.

3. Statistical Analysis

The percentage of improvement in performance calculated by the following formula:

$$\frac{Data\ before\ treatment - dataa\ after\ treatment}{Data\ before\ treatment} x100$$

3.1 Timed up and Go test (TUG Test)

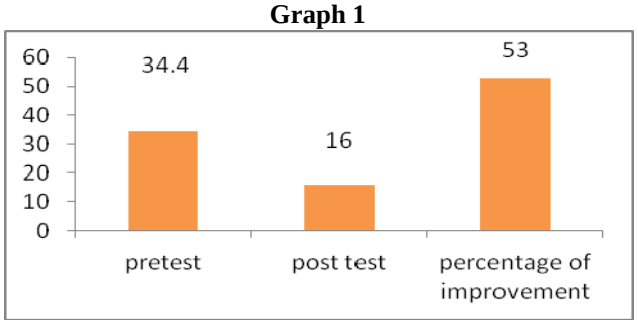
The total average % of improvement in performance is 53%

Table 1

S. No	*Pre-test score*	*Post-test score*	*%Improvement*
1	35	16	54%
2	34	16	52%
3	33	15	54%
4	36	18	50%
5	34	15	55%
Average Total	34.4	16	53%

Data Analysis of the subjects after dual task training led to a greater improvement in functional walking capacity and step length. The average percentage of improvement in timed up and go test is 53%.

Graph 1



4. Conclusion

Data Analysis of the subjects after dual task training led to a greater improvement in functional walking capacity and step length. The average percentage of improvement in timed up and go test is 53%.

This shows that there is a significant improvement in functional walking capacity in Parkinson's subject after dual task training.

Dual task training will improve step length and functional walking capacity in idiopathic Parkinson's disease. Thus it can be added in Rehabilitation of Parkinson's subjects for improvement of walking capacity.

5. Discussion

A training program to improve gait while dual tasking in patients with parkinson's disease impairment in the ability to perform another task while walking (ie, dual tasking [DT]) are associated with an increased risk of falling. The 4- week programs of one-on-one training including walking while performing several distinct cognitive tasks. Gait speed and gait variability during DT significantly improved. Improvements were also seen in the DT conditions that were not specifically trained and were retained 1 month after training.

Task walking deficits in people with parkinson's disease: Motor and cognitive contributions, mechanisms, and clinical implications.

The treatment of the PD aims to preserve a patient's independence and quality of life. Medication is used to treat motor & non motor symptom relief and also seeks to minimize adverse effects. Medical treatment with levodopa is considered the most effective for the management of motor symptoms. The use of levodopa has been associated with an increased risk of motor fluctuations and the occurrence of involuntary movements or dyskinesia.

Parkinson's disease clinical presentation may vary between individuals. The typical motor symptoms are tremor at rest, rigidity, bradykinesia, and postural instability.

Motor symptoms usually begin on one side of the body and gradually progress to the opposite side. Although these symptoms may be present in other forms of Parkinsonism, symptoms with asymmetric onset, gradual progression and response to treatment based on levodopa are indicative of idiopathic PD diagnosis.

Disorders of gait are one of the most common symptoms of Parkinson's disease. Specifically, patients tend to demonstrate a shuffling gait pattern with a shortened stride length and a reduced over all velocity.

This study Results in better balance during dual task gait conditions in older adults with balance impairment than fixed priority training, so this approach will be gradually introduced.

References

[1] A nieuciboer et al (2007); cueing training in the home improves gait related mobility in Parkinson's disease: the Rescue trial.
[2] Agid Y. et al (1991); Parkinson's diseas. The hanced 337: 1321 – 1323.
[3] Ben sideway et al (2005); effect of long term gait training using visual cues in an individual with Parkinson's disease.
[4] Chen JJ et al (2010); Parkinson's disease S 87 – 93
[5] Cohen, Tillerson et al (2003); Neuroprotective effects of prior limb use in 6 hydroxy deprive treated rats. Journal of Neuro chemistry 299-305.
[6] De han LM, Breteler et al (2006); Epidemiology of Parkinson's disease 525-35.
[7] Hirsch et al (2009); Exercise anneuroplasticity in persons living with Parkinson's disease; European journal of Physical rehabilitation medicine 45: 215 – 29
[8] Hoehn and yarr et al (1967); Parkinsonism: onset, progression and mortality. Neurology 17: 427-42
[9] Jankonic J et al (April 2008)"; Parkinson's disease, clinical features and diagnosis Journal. Neurol. Neurosurg. Psychiatr 79(4):
[10] Morris et al (1999); stride length regulation in Parkinson's disease normalization strategies and underlying mechanisms. Brain 119: 551 – 68.
[11] Nieuwboer et al (2001); The effect of a home physiotherapy program for persons with parkinsonism's disease. Journal of rehabilitation medicine 33: 266 – 72.
[12] Obeso et al (2002); The basal ganglia and disorder of movement: pathophysiological mechanisms, News in physiological science 17 : 51- 55.
[13] Pallone et al (2007); introduction to parkinson's disease. Disease a month 53: 195 – 199.
[14] Rezak et al (2007); Current pharmaco therapeutic treatments options in Parkinson's disease' Disease a month 5: 214 – 222.

[15] Rowe J, et al (2002); Attention to action in Parkinson's disease: impaired effective connectively among frontal cortical region Brain 125 (2): 1783 – 1793.
[16] Rubinstein et al (2002); the power of cueing to circumvent dopamine deficits: a review of physical theraphy treatment of gait disturbances in Parkinson's disease (171448-1160).
[17] Schankman et al (2010); A randomized controlled trial of movement strategies compared with exercise for people with Parkinson's disease. Movement disorders: 2010.
[18] Selva kumar et al (2008 April); the importance of external cueing strategies in improving balance and gait in idiopathic Parkinson's disease.
[19] World health organization Ageing and health in the WHO south, East Asia region, world health report (1999); 3-4.