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# Effect of visual cues with dual task in improving gait parameters in patient with parkinson's disease"- Comparative study

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**Abstract**
**Introduction:** Parkinson's disease is a chronic progressive disease of the central nervous system which is associated with a degeneration of the dopamine producing cells in the substantia nigra. Gait is one of the main impairments that causes the greatest handicap to persons with Parkinson's. Gait training is trained in the early stage of this disease to triumph over the difficulties. This study is planned to establish the effectiveness of visual cueing in improving the gait parameters in patient with Parkinson's disease.
**Objectives:** Primary objective of this study was to find out the Effectiveness of visual cues with dual task in improving gait parameters in patient with Parkinson's disease. Secondary objective of this study was to compare the Effective of visual and visual cues along with dual task activities.
**Methods:** Thirty participants between the ages of 45- 65 years, with the clinical diagnosis patients with idiopathic Parkinson's disease. Thirty patients were divided into two groups, Group-I received visual cueing (n=15) and Group-II received visual cueing along with dual tasks activities (n=15). Both the groups were trained for a time period of 30 minutes, 3days a week for 6 weeks.
**Results:** After 6 weeks of treatment period, visual cueing group-I scored significantly higher with the parameters of gait such as Stride length and Walking velocity with 't' values 3.1494 and 4.2314 respectively at $p<0.05$ thus proving that result of the study suggests that there is significant difference between the pre and post-test in the study when "t" was performed.
**Conclusion:** The Visual cueing was more effective in improving the gait parameters as compare to visual cues along with dual task activities in patients with Parkinson's disease.

**Keywords:** parkinson's disease, gait training, visual cueing, dual task activities, stride length, walking velocity

## Introduction

Parkinson's disease is a chronic progressive disease of the central nervous system which is associated with a degeneration of the dopamine producing cells in the substantia nigra. People with Parkinson's disease are well known for having a shuffling gait, difficulty initiating movements, stooped forward posture, marked postural instability, bradykinetic movements and tremors. These features are termed as red flags of Parkinson's disease and severely compromise an individual's daily functions, role and activities. The beginning of this disease is insidious with slow rate of progression eventually causing disability attributed by combined effects of many impairments [1].

The crude age-adjusted prevalence rate of Parkinson's disease in India is per 100,000 populations is 14 in Northern India, 27 in the South and 16 in the East [2]. The increasing life expectancy of Indians, in the last decade, is likely to result in an increase in age-related diseases like Parkinson's Disease (PD) and Alzheimer's diseases [3]. In the world's 580 million elderly population (>60 yrs), 355 million (61%) live in developing countries and of these, 77 million (22% of total) live in India.[4] 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 [5].

Loss of terminals in the striatum is the first neurodegenerative change that occurs in this disorder, accompanied by the accumulation of aggregated proteins in nigral processes known as Lewy neurites. Indeed, a recent study reported extensive axonal pathology, abnormal accumulation of monomeric and aggregated α synuclein, and Lewy neurites in the striatum of patients with few body diseases.[6]Furthermore, in a neurotoxin-induced rat model of Parkinson's disease the appearance of Lewy-body-like inclusions in nigrostriatal terminals might be followed by retrograde degeneration, further accumulation of aggregated proteins in nigral cell bodies (Lewy bodies) and, finally, reactive gliosis and cell death and can lead to reduction in spontaneous movement. Hence basal ganglia play an important role in production of voluntary movements and control of postural adjustments associated with voluntary movements [7-9].

Damage to basal ganglia leads to motor disturbances that can be hyperkinetic or hypokinetic. Hyperkinetic disturbances are characterized by excessive or abnormal movement, hypokinetic disturbances are signalized by slowness or lack of movement. Loss of dopaminergic neurons influence lead the way to reduced spontaneous movements, thus the patients want to move but cannot, tremor and rigidity are adjudged as a release phenomenon representative of loss of inhibitory influence within the basal ganglia. Significant change in striatal dopamine receptor materialize resulting in decreased binding sites for dopamine in the BG [10].

This progressive degenerative disease of nervous system is marked by the cardinal features of rigidity, akinesia, bradykinesia, a tremor and postural instability where rigidity is hallmark of PD in which patient feels heaviness and stiffness of their limbs and sometime muscular pain which is defined as resistance to passive motion which is not velocity dependent and is felt uniformly in both group of muscles. Rigidity is present regardless of the task, amplitude, or speed of movement which incorporate two types: cogwheel and leadpipe. Prolong effect rigidity results in restricted range of motion, loss of bed mobility and loss of reciprocal arm swing during gait. These are often related to degree of trunk and arm rigidity. The rigidity and depression influence bradykinesia which is identified as poverty of voluntary movement, with a slower initiation of movement and a progressive reduction in the speed and amplitude of repetitive actions. The sign is established firstly by general observation, notably the lack or slowness of spontaneous movement and absent arm swing on walking, difficulty maintaining movement [11-12].

Postural stability is an integral component of the motor control and coordination process of the body, which is required for preserving steadiness during static and dynamic activities.PD patients demonstrate postural and balance instability which varies according to BOS (base of support) and attention.Patient demonstrate abnormal and inflexible postural response controlling their centre of mass within the base of support [13]. Shuffling gait is part of compensatory change, with the shortening of the stride length reducing postural instability. Patient’s ability to initiate or sustain movement may be affected by transient loss of voluntary movement of the feet. Such freezing episodes usually occur late in the disease and are often related to ‘off’ periods, when medication is failing. Freezing and festination (increased step frequency with very small step amplitude), often occur together during specific activities, such as making a turn, or in specific locations, such as narrow spaces [14].

The factor to postural instability, decrease muscle torque production of weakness loss of available ROM particularly of trunk motions and axial rigidity progressive development of posture deformity occurs weakness of antigravity muscle which contribute to the Simon stooped posture and flexed neck trunk hip and knee This result in significant change in centre of alignment and centre of gravity which causes decrease in gait parameters [15].

Despite the frequency of gait disorders in PD, there have been few attempts to quantify the locomotor pattern or to identify the fundamental motor control deficits in Parkinson’s gait. Typically, slowness of walking is associated with a reduced stride length, decreased cadence (steps per minute) and an increase in the proportion of the gait cycle spent in the double limb support phase of stance (DLS) [16-21]. However, clinical observations have led to suggest that when velocity is taken into account, the walking cadence is in fact higher and the stride length is shorter in PD patients than elderly controls [22].

Another characteristic feature of PD is the difficulty to perform two tasks simultaneously. The analysis of the performance cost of a task executed simultaneously with a secondary task is called dual task [23].

Visual cues or auditory cues described to assist or improve gait in Parkinson’s patients. Visual cues are commonly used to aid stride regulation in people with Parkinson’s disease. Dual task was important in the degree of interference with stride length in Parkinson’s disease subjects, but had less of an effect on velocity and none on cadence. People with Parkinson’s disease showed a greater reduction in stride length with the added calculation or language tasks than with the added motor tasks. This shortening of stride length with added cognitive tasks is supported by previous studies of gait in Parkinson’s disease patients with added cognitive tasks [24].

**Objectives**

This study was done in effort to find out the effect of visual cues with dual task in improving gait parameters in patients with Parkinson’s disease.

**Material and methods**

An Ethical approval was taken by the ethical committee of the institution before undertaking the study and a written consent was taken from the participants explaining the entire procedure of the study before recruiting them in the study.

- Study design: prospective comparative study.
- Sample size: A total of 30participants between the age of 45-65 years were included in this study.
- Duration of study: This study was conducted over a duration of 10 months.
- Study population: Patient diagnosed with idiopathic Parkinson’s disease of stage II and III as per Hoehn and Yahr scale of disability.

**Inclusion Criteria**

- Clinically diagnosed patients with idiopathic Parkinson’s of stage II and III as per Hoehn and Yahr scale of disability (Annexure-2).
- Male & female patients with age group between 45 to 65 years.
- Patients having intact basic calculating ability.

**Exclusion criteria**

- Patients with any other neurological disorders impairing balance and gait (h/o vertigo, Stroke, Multiple sclerosis, Peripheral Neuropathies etc.)
- Patients with any associated musculoskeletal disorders. (Post fracture stiffness, Arthroplasty, Osteoartheitis. etc.)
- Patients with any other associated cardio-respiratory illness (asthma, chronic obstructive pulmonary disease etc)
- Patients with visual problems.
- Patient with cognitive impairment.

**Outcome measures**

The following were the outcome measures used in this study:-

**Stride length**

Stride length was measured by measuring the distance from the point of heel strike of one extremity to the point of heel strike of the same extremity and was determined by measuring the linear distance from the point of heel strike of one lower extremity to the next heel strike of the same extremity. The stride length was measured in cms.

**Walking velocity**

Walking velocity was measured in either cm/sec or mts/min. To obtain the individual's walking velocity, divide the distance travel by the time required to complete the distance.

$$\text{Walking velocity} = \frac{\text{Distance}}{\text{Time}}$$

**Randomization**

- Study setting.
- Allocation: Participants were allocated in group I (visual cues) and Group II (visual cues along with dual task).
- Implementation: the method of randomization and allocation of the samples in the study was done by researchers themselves.

**Procedure**

In all, 47 participants were screened and after finding their suitability according to the inclusion and exclusion criteria, they were requested to participate in the study. The individuals who were willing to participate in the study were briefly explained about the nature of the study in the language best understood by them. They were encouraged to clarify queries regarding the study, if any. An informed written consent form, previously approved by the IEC was then obtained from the participants. The demographic data was obtained and detailed assessment was done.

Thirty Parkinson's subjects were randomly selected based on the selection criteria and divided into two groups Group-I and Group-II. All the subjects were assessed using a general neurological proforma (Annexure-1) and a detailed explanation was given about the procedure to be done. Group-I subjects was asked to walk with visual cues and Group-II was asked to walk with visual cues along with dual task which comprised of calculation and a motor task. All the subjects were undergoing convention physiotherapy which includes cardiovascular warm up activities, stretching exercises, strengthening exercises in functional context, functional training, gait training. The subjects were made to walk 3 times per week, for duration of 30 minutes for 6 weeks.

**Group-I**

15 Participant in this group were asked to walk on a 10m walkway where visual cues in the form of 10 m strips in length and 3 cm wide black masking tape was placed which were placed along the line of movement. These subjects were asked to walk twice on the walkway and were allowed to rest whenever they desired. Stride length and walking velocity were then measured, since the subjects were made to walk twice, the average of the two readings was taken into consideration. Two trials of walking with visual cues were given prior to taking the measurements.

**Fig 1:** A Participant of Group-I Receiving Gait Training with Visual Cues

**Group-II**

Participant in this group were asked to walk twice on a 10m walkway with visual cues in the form of one meter strip of 3 cm wide black masking tape. During walking, these subjects were simultaneously asked to perform dual tasks which included a calculation and a motor task. When performing the dual tasks subjects were instructed to concentrate on both the gait and added task at the same time. The calculation task was given first which required the subjects to count backwards in threes from a number between 20 and 100 randomly selected by the examiner.

The motor task which was assigned next, required the subjects to press the button of a buzzer which was kept at every 2meter distance with the preferred thumb. Stride length and walking velocity were measured during walking and since the subjects were made to walk twice the average of the two readings were taken into consideration. Two trials of walking with visual cues along with dual task were given prior to taking the measurements.

To assess the gait parameters, the patients were asked to relax and walk from a starting point marked on the floor after immersing the affected foot in a tray containing chalk powder paste to gain the impressions of the foot. Stride length was measured from heel strike of one extremity to the heel strike of the same extremity using an inch tape and walking velocity was measured by the time taken by the subjects to cover a distance of 20 meters. These measurements were recorded before intervention and at the end of 6th week of intervention.

**Fig 2:** A Participant of Group-II Receiving Dual Task Along With Visual Cues

**Statistical analysis**

Data was analyzed using Graph Pad Instat Trial Version 13.3. Descriptive statistics for all outcome measures were expressed as mean, standard deviations variance and test of significance such as t test. The confidence interval was set as at 95% and data was considered statistically significant with p <0.05 and highly significant with p <0.01.

Thirty Patients with Parkinson's disease with a mean age of 55.15years, and SD+4.64were selected for the study.

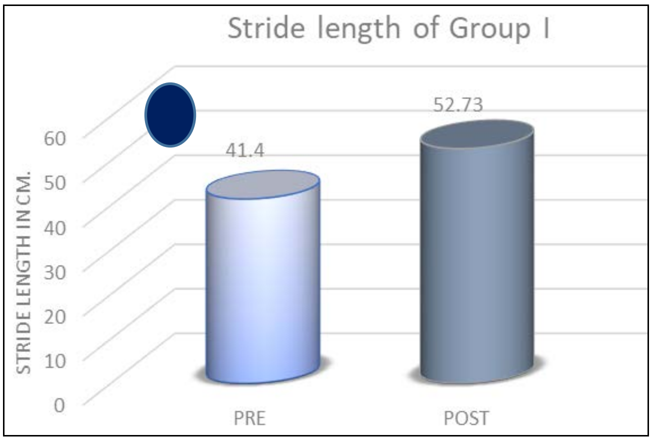
**Table 1:** Pre & Post Values of Stride Length in Group-I

| Time Interval | No. of Subjects | Mean | SD | 't' value | 'P' value |
|---|---|---|---|---|---|
| Pre | 15 | 41.40 | 6.38 | 12.6721* | <0.05 |
| Post | 15 | 52.73 | 5.48 | | |

(Comparison of Pre-Intervention and Pos-Intervention score of stride length of group I by Using paired t test)

* Calculated 't' value is significant at p<0.05 with df = 14 (Table 't' value=1.761)

The above Table-4.5 shows the value of 't' as 12.6721 for Group-I for the pre & post values of Stride Length to assess the Gait parameter of Patients with Parkinson's. 't' value is greater at p<0.05, which is significant & hence Visual Cueing had an effective improvement in the Gait parameter of the patients with Parkinson's in Group-I. The improvement in the mean of Stride Length is showing in the graph of graph-4.5.




**Graph 1:** Mean of Pre & Post Test Values of Stride Length for Group-I

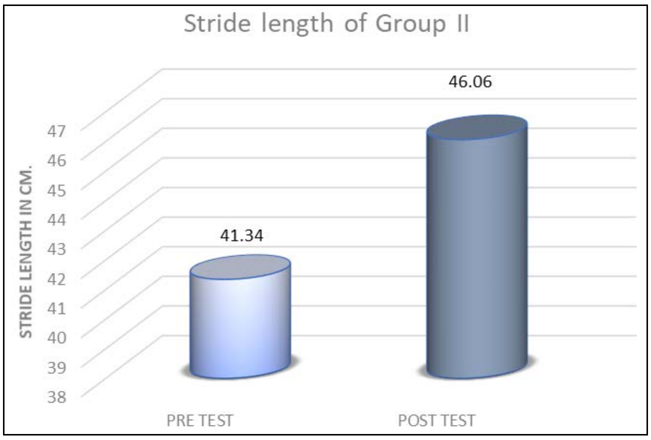
**Table 2:** Pre & Post Test Values of Stride Length in Group-II

| Time Interval | No. of Subjects | Mean | SD | 't' value | 'P' value |
|---|---|---|---|---|---|
| Pre | 15 | 41.34 | 6.44 | 8.7330* | <0.05 |
| Post | 15 | 46.06 | 5.98 | | |

(Comparison of Pre-Intervention and Pos-Intervention score of stride length of group II by Using paired t test)

* Calculated 't' value is significant at p<0.05 with df = 14 (Table 't' value=1.761)

The above Table-4.6 shows the value of 't' as 8.7330 for Group-II for the pre & post values of Stride Length to assess the Gait parameters of Patients with Parkinson's. 't' value is greater at p<0.05, which is significant & hence Visual Cueing & Dual Task Activity together had an effective improvement in the Gait parameter of the patients with Parkinson's in Group-II. The improvement in the mean of Stride Length is showing in the graph-10.



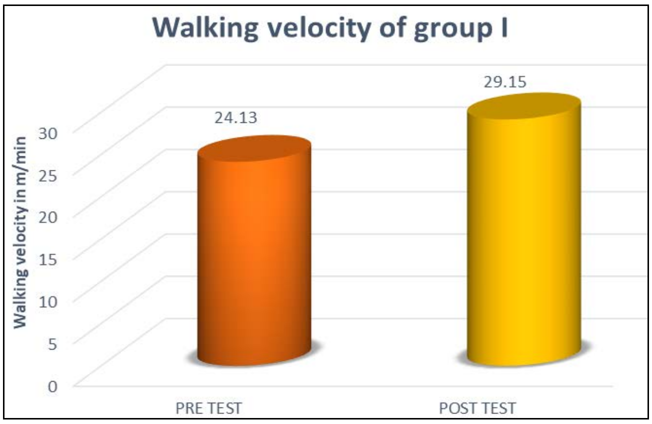

**Graph 2:** Mean of Pre & Post Test Values of Stride Length for Group-II

**Table 3:** Pre &Post Test Values of Walking Velocity in Group I

| Time Interval | No. of Subjects | Mean | SD | 't' value | 'P' value |
|---|---|---|---|---|---|
| Pre-Test | 15 | 24.13 | 2.87 | 10.35* | <0.05 |
| Post-Test | 15 | 29.15 | 2.48 | | |

(Comparison of Pre-Intervention and Pos-Intervention score of walking velocity of group I by Using paired t test)
*Calculated 't' value is significant at p<0.05 with df = 14 (Table 't' value=1.761)

The above Table-4.7 shows the value of 't' as 10.35 for Group-I for the pre & post values of Walking Velocity to assess the Gait parameter of Patients with Parkinson's. The improvement in the mean of Walking Velocity is showing in the graph of graph-4.7.



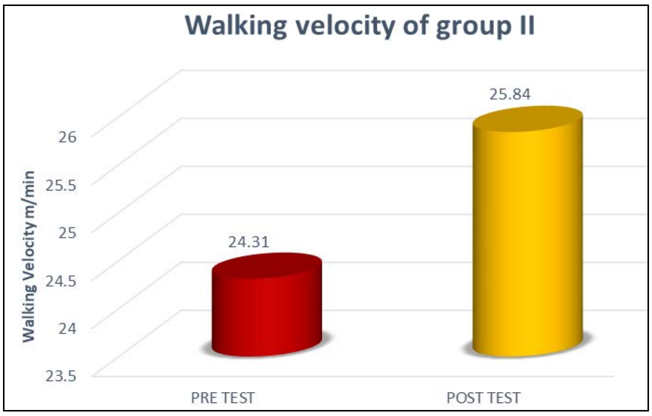

**Graph 3:** Mean of Pre & Post Test Values of Walking Velocity for Group-I

**Table 4:** Pre & Post Test Values of Walking Velocity in Group-II

| Time Interval | No. of Subjects | Mean | SD | 't' value | 'P' value |
|---|---|---|---|---|---|
| Pre-Test | 15 | 24.31 | 2.99 | 3.3901* | <0.05 |
| Post-Test | 15 | 25.84 | 2.04 | | |

(Comparison of Pre-Intervention and Pos-Intervention score of walking velocity of group II by Using paired t test)
* Calculated 't' value is significant at p<0.05 with df = 14 (Table 't' value=1.761)

The above Table-4.8 shows the value of 't' as 3.3901 for Group-II for the pre & post values of Walking Velocity to assess the Gait parameters of Patients with Parkinson's. The improvement in the mean of Walking Velocity is showing in the graph of graph-4.8.




**Graph 4:** Mean of Pre & Post Values of Walking Velocity in Group-II

**Table 5:** Pre & Post Values of Stride Length in Groups I and II

| Time Interval | Study Group | No. of Subjects | Mean | SD | 't' value | 'P' value |
|---|---|---|---|---|---|---|
| Pre-Test | Group-I | 15 | 41.40 | 6.38 | 0.0314 | <0.05 |
| | Group-II | 15 | 41.34 | 6.44 | | |
| Post-Test | Group-I | 15 | 52.73 | 5.48 | 3.1494 | <0.05 |
| | Group-II | 15 | 46.06 | 5.98 | | |

(Comparison of Pre-Intervention and Pos-Intervention score of Stride length of group I and II by Using Unpaired t test)
* Calculated 't' value is significant at p<0.05 with df = 28 (Table 't' value 1.701)

### Interpretation

The above table-4.9 shows the value of t = 0.0314 at p<0.05 for the pre-test scores of Stride Length between Group-I & Group-II, as the t' value is lesser than the table value (1.701) it is concluded that there are no significant variations between the pre-test scores of Stride Length of Patients with Parkinson's in both the groups proving the homogeneity of the groups.

When the mean difference of the pre & post-test values of Stride Length were subjected to independent 't' test, the calculated value of 't' was found to be 3.1494 which is significant at p<0.05 and hence it was concluded that Visual Cueing had a significant effect in improving the Gait parameters of Patients with Parkinson's considered for the study in Group-II.

**Table 6:** Pre & Post Test Values of Walking Velocity in Group I and II

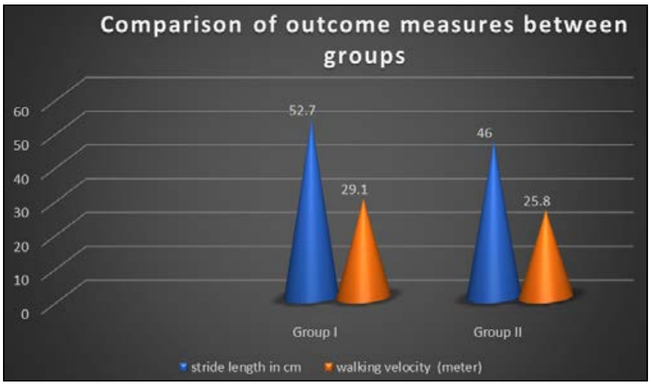
| Time Interval | Study Group | No. of Subjects | Mean | SD | 't' value | 'P' value |
|---|---|---|---|---|---|---|
| Pre-Test | Group-I | 15 | 24.13 | 2.87 | 0.1727 | <0.05 |
| | Group-II | 15 | 24.31 | 2.99 | | |
| Post-Test | Group-I | 15 | 29.15 | 2.48 | 4.2314 | <0.05 |
| | Group-II | 15 | 25.84 | 2.04 | | |

(Comparison of Pre-Intervention and Pos-Intervention score of Walking velocity of group I and II by Using Unpaired t test)
* Calculated 't' value is significant at p<0.05 with df = 28 (Table 't' value = 1.701)

### Interpretation

The above table-4.10 shows the value of t = 0.1727 at p<0.05 for the pre-test scores of Walking Velocity between Group-I & Group-II, as the t' value is lesser than the table value (1.701) it is concluded that there are no significant variations between the pre-test scores of Walking Velocity of Patients with Parkinson's in both the groups proving the homogeneity of the groups.

When the mean difference of the pre & post-test values of Walking Velocity were subjected to independent 't' test, the calculated value of 't' was found to be 4.2314 which is significant at p<0.05 and hence it was concluded that Visual Cueing had a significant effect in improving the Gait parameters of Patients with Parkinson's considered for the study in Group-II.




**Graph 5:** Mean Improvement of the Gait Parameters between Group-I & Group-II

### Interpretation

The above graph -13 shows the value for mean improvement in the Gait parameters of the Patients with Parkinson's assessed using Stride Length and Walking Velocity. It is very clear from the graph that there is significant improvement of Gait parameters among Group-I subjects trained with Visual Cueing when compared to the subjects of Group-II trained with both Visual Cues & Concurrent Tasks. Hence it can be concluded that Visual Cueing had a significant effect in improving the Gait parameters of Patients with Parkinson's (Group-I) considered for the study.

### Discussion

The present study "Effect of visual cues with dual task in improving gait parameters in patients with Parkinson's disease." was carried out where gait parameters stride length and walking velocity was measured from clinically diagnosed patients with idiopathic Parkinson's disease of stage II and III as per Hoehn and Yahr scale of disability. The findings in this study shows that a 6-week gait training program using visual cues could improve the walking ability of the patients with Parkinson's. In this study, totally 30 subjects were selected and assigned randomly to two groups of 15 subjects each who received visual cueing (Group I) and visual cueing along with dual tasks activities (Group II) respectively. The two groups were analyzed with parameters of gait such as Stride length and walking velocity. The mean for both the groups was calculated and the statistical analysis of the values showed considerable increase in mean improvement for the Group-I than the Group-II which proved that the subjects who received visual cueing had a better outcome improving their gait parameters than the group of visual cueing along with dual tasks activities.

The result Obtained from this study indicated that there was changed in gait parameters stride length and walking velocity of both group with using of visual cues and visual cues along with dual task activities in the patients with Parkinson's disease. Stride length is the distance between two successive foot placements. The effect of task type on dual task interference with gait in Parkinson's disease is less clear. Decreases in stride length and velocity have been found when concurrently performing a cognitive task of sentence recitation or word recitation. Similar changes in gait have been reported when performing the concurrent motor task of carrying a tray with glasses. Two studies have specifically compared the effects of concurrent cognitive and motor tasks on gait in people with Parkinson's disease and have found conflicting results [25].

The mechanism by which visual cues are able to improve gait in patients with Parkinson's disease has not yet been determined. But there are four possible mechanisms suggested: (1) visual cues focus the attention of the person onto the gait task, in effect bypassing the automatic internal cueing device of the basal ganglia supplementary motor area interaction that is faulty in patients with Parkinson's disease; and (2) visual cues encourage the formation of a better motor set in the supplementary motor area leading to improved motor performance from the outset (3) The visual cues draw the attention of the patient invoking alternative, more conscious, motor control pathway in the regulation of the gait.(4)Enabling the faulty basal ganglia to be bypassed. (Morris *et al* 1996a). The fact that our study found no detriment in the ongoing performance of either task with added cues lends support to the motor set theory. Sight of the cues may help to form a more accurate motor set in the supplementary motor area which is carried through until the end of that motor sequence. If the paper strips provided regular cues to the supplementary motor area via the cortex, it would be more likely to have resulted in dual task interference with either the gait or concurrent task during testing.

As per available information, various studies have been done to find out the effectiveness of visual cueing and dual task but this seems to be the first objective investigation of the comparison between the both in improving the parameters of gait in Parkinson's. A study by Lewis GN *et al* (2008) showed significant increase in the parameters of gait such as stride length and walking velocity with visual cues when compared to baseline conditions [26]. In another study done by Robyn Galetly *et al* (2005) where concurrent task was given while walking the gait parameters seemed to decrease [27].

A study conducted by Jean-Philippe Azulay *et al*, and concluded that the results presented here suggest that in Parkinson's disease, visual cueing can facilitate locomotion and that this facilitation is linked to the visual perception of motion rather than to position or orientation. A study conducted by Jean-Philippe Azulay *et al*, cc, visual cues may contribute to attention and/or to vision depending on the situation. A common mechanism may be the shunt of the Basal Ganglia–Supplementary Motor area interaction either by a more important implication of the motor cortex by attention or by the activation of a specific visuomotor pathway for external stimuli. Visual cues may be a good support but the therapist must know that attention as well as vision may improve or deteriorate locomotion depending on the context [28].

It is well established that when asked to perform a concurrent task when walking, people with PD demonstrate reduced gait velocity, step length, increased stride to stride variability and more freezing episodes than when walking alone. These gait disturbances are also known falls risk factors. An underlying rationale proposed for dual task interference in PD is that when required to perform two tasks at the same time, one runs through the frontal cortical regions and is under conscious control while the other is controlled by the defective basal ganglia. The task controlled by the frontal lobes is typically performed with normal speed and amplitude whereas the task controlled by the basal ganglia may show errors and be under-scaled in speed, amplitude and force [45]. One factor that may limit the efficacy of a cognitive strategy is the need for increased cognitive resources to modify gait during complex walking tasks. The neural control of walking under simple conditions is characterized by two invariant features – progression, defined as the ability to move in the desired direction, and stability, defined as the ability to control the body's center of mass with respect to the base of support. While progression and stability sufficiently describe the task requirements for walking in very simple environments, mobility in the home and community requires adaptation, defined as the ability to continuously modify the gait pattern in response to varied task demands and environmental circumstances.

The following study showed that the concurrent tasks requiring calculation and language skills caused deterioration in stride length in Parkinson's disease subjects, while the concurrent button-clicking motor task did not. The language task was more complex than the calculation task, thus the effect was not due to task complexity alone. Visual cues remained effective in improving stride length of people with Parkinson's disease while concurrent tasks are being performed, suggesting that the attention capacity or ability to prioritise activities is not exceeded in this situation [29]. Another evident study conducted by O'Shea *et al* (2002) compared gait performances when concurrently transferring coins from one pocket to another (motor task) with counting backwards by threes (cognitive task). They found that while adding either concurrent task detrimentally altered gait in people with Parkinson's disease, there was no difference in stride length, walking velocity or cadence between the motor and cognitive tasks [49]. In contrast, Rochester *et al* (2004) found that people with Parkinson's disease reduced their walking speed and step length when concurrently answering questions, but not when carrying a tray with cups [30].

## Conclusion

This study concludes that the subjects who received visual cueing had a better outcome improving their gait parameters than the group of visual cueing along with dual tasks activities with the duration of 6 week. Thus, the null hypothesis of the study can be rejected and the experimental hypothesis accepted because there is significant difference in the gait parameters in the Parkinson's patients using visual cueing over visual cueing along with dual task activities was accepted.

## Limitations

- The study conducted in patients with Parkinson's for gait and so the study does not any role in the rigidity which is the main characteristic feature for affecting the gait.
- This study was done only with the Stage II and III of Parkinson's other early and later stages were not considered.
- This study was done only with the age group ranging from 45-65 years, other age groups were not considered.
- Only two parameters of the gait were included in the study to assess the improvement in the gait of the patients with Parkinson's.

## References


1. Kevin JB, Sandy Zindars, Kathryn RZ, Teresa MS. Testing Functional Performance in people with Parkinsonism. Physical Therapy,2005:85(2):134-412.
2. Wadia NH. Dissecting Parkinson's. Frontline, India's National Magazine. The Hindu, 2002, 19(9).
3. World Health Organization. Ageing and Health in the WHO South East Asia Region. World Health Report, 1999, 3-4.
4. HelpAge India. Ageing Scenario. HelpAge India, editor. http://www.helpageindia.com. HelpAge India. Ref Type: Electronic Citation, 2002.
5. Sunderlal *et al*. A study on senior citizens in rural areas. Health for the millions. Health for the Millions, 1999:25:18-20.
6. Duda JE, Giasson BI, Mabon ME, Lee VM, Trojanowski JQ. Novel antibodies to synuclein showabundant striatal pathology in Lewy body diseases. Ann. Neurol. 52, 205210, 2002.
7. Sauer H, Oertel WH. Progressive degeneration ofnigrostriatal dopamine neurons following intrastriatal terminallesions with 6-hydroxydopamine: a combined retrogradetracing and immunocytochemical study in the rat. Neuroscience,1994:59:401-415.
8. Lee CS, Sauer H, Bjorklund A. Dopaminergic neuronaldegeneration and motor impairments following axonterminal lesion by intrastriatal 6-hydroxydopamine in the rat. Neuroscience,1996:72:641-653.
9. Sohal RS, Weindruch R. Oxidative stress, caloricrestriction, and aging. Science, 273.
10. Smith CD *et al*. Excess brain protein oxidation andenzyme dysfunction in normal aging and in Alzheimerdisease. Proc. Natl Acad. Sci. USA,1991:88:10540-10543.
11. Jenner P. Oxidative mechanisms in nigral cell death in Parkinsons disease. Mov. Disord, 1998:13(Suppl.1):24-34.
12. Alam ZI *et al*. Oxidative DNA damage in the parkinsonianbrain: an apparent selectiveincrease in 8-hydroxyguanin levels in substantia nigra. J. Neurochem,1997:69:1196-1203.
13. Wikstrom EA, Tillman MD, Smith AN, Borsa PA. A new force-plate technology measure of dynamic postural stability: the dynamic postural stability index. J Athl Train,2005:40(4):305-309.
14. Giladi N, Shabtai H, Rozenburg E *et al*. Gait festination in Parkinson's disease. Parkinsonism Relat. Disord,2001:7:135-138.
15. Susan BO'Sullivan, Thomas JS. Physical Rehabilitation Assessment and Treatment. Jay Pee Brothers, 6th ed, 2001, 813.
16. Knutsson E, Martensson A. Quantitative effects of L-dopa on different types of movements and muscle

toneinparkinsonian patients. Scand J Rehabil Med,1971:3:121-30.
17. Murray MP, Sepic SB, Gardner GM, Downs WJ. Walking patterns of men with parkinsonism. Am J Phys Med,1978:57:278-94.
18. Stern GM, Franklyn SE, Imms FJ, Prestidge SP. Quantitative assessments of gait and mobility in Parkinson's disease. J Neural Transm, 1983:9(Suppl1):201-14. 21.21.21.
19. Blin O, Ferrandez AM, Serratrice G. Quantitative analysis of gait in Parkinson patients: increased variabilityofstride length. J Neurol Sci,1990:98:91-7.
20. Bowes SG, Clark PK, Leeman AL, O'Neill CJA, Weller C Nicholson PW *et al*. Determinants of Gait in the elderly parkinsonian on maintenance levodopa/ carbidopa therapy. Br J Clin Pharmacol,1990:30:13-24.
21. Brooks DJ, Salmon EP, Mathias CJ, Quinn N, Leenders KL, Bannister R *et al*. The relationship between locomotor disability, autonomic dysfunction, and the integrity of the striatal dopaminergic systemin patients with multiple system atrophy, pure autonomic failure, and Parkinson's disease, studied with PET. Brain,1990:113:1539-52.
22. Wall JC, Turnbull GI. The kinematics of gait. In: Turnbull GI, editor. Physical therapy management of Parkinson's disease. New York: Churchill Livingstone, 1992, 49-67.
23. Ladewig I. A important ciada atençãonaaprendizagemdehabilidadesmotoras. Rev Paul Educ Fís,2000:3(Suppl):S62-71.
24. Does the type of concurrent task affect preferred and cued gait in people with Parkinson' sdisease? Robyn Galletly1 and Sandra G Brauer1, 21 Division of Physiotherapy, University of Queensland 2 Department of Physiotherapy, Princess Alexandra Hospital, Brisbane.
25. Sidaway B, Anderson J, Danielson G, Martin L, Smith G. Effects of long-term gait training using visual cues in an individual with Parkinson disease. Physical therapy,2006:86(2):186-94.
26. Lewis GN, Byblow WD, Walt SE. Stride length regulation in Parkinson's disease: the use of extrinsic, visual cues. Brain,2000:123(10):2077-90.
27. Galletly R, Brauer SG. Does the type of concurrent task affect preferred and cued gait in people with Parkinson's disease? Australian Journal of Physiotherapy,2005:51(3):175-80.
28. Azulay JP, Mesure S, Blin O. Influence of visual cues on gait in Parkinson's disease: contribution to attention or sensory dependence? Journal of the neurological sciences,2006:248(1):192-5.
29. Sayed HM, Fayez ES, El Rahman SM, Yamany AA. Visual cues training on Parkinsonian gait: a randomized controlled study. Egypt J Neurol Psychiat Neurosurg,2013:50(3):331-7.
30. Rochester L, Hetherington V, Jones D, Nieuwboer A, Willems AM, Kwakkel G *et al*. The effect of external rhythmic cues (auditory and visual) on walking during a functional task in homes of people with Parkinson's disease. Archives of physical medicine and rehabilitation,2005:86(5):999-1006.