



Original Research Article

## Effectiveness of Movement Strategies Training in Individuals with Parkinson's Disease - Pilot Study

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### ABSTRACT

**Objective:** To compare the effectiveness of Movement Strategies Training (MST) along with conventional physiotherapy and only conventional physiotherapy on motor control, cognitive function and balance in individuals with Parkinson's Disease (PD).

**Participants:** Ten individuals between 50-80 years of age having clinical diagnosis of idiopathic PD divided into study group received the MST along with conventional physiotherapy and Control group received only conventional physiotherapy.

**Outcome measures:** Unified Parkinson's Disease Rating Scale, Mini Mental State Examination, Timed up and go test .

**Results:** Study group (group a) showed statistically significant improvement on all outcome measures after 8 weeks of intervention ( $p < 0.05$ ). this 8 weeks study results shows greater improvement in mst group in compare with conventional physiotherapy group so this result

**Conclusion:** Mst is An Effective in Improving Motor Control, Cognitive Function and Balance in Individuals With Pd.

**Key words:** Conventional Physiotherapy, Movement Strategies Training, Mini Mental State Examination, Parkinson's disease, Timed Up and Go Test.

### INTRODUCTION

Parkinson's disease (PD) is the most common neurodegenerative movement disorder. <sup>[1]</sup> The incidence of PD is about 10 to 20 new cases per 100,000 populations per year. <sup>[2]</sup> Prevalence of PD in India around 328/100,000 people, more among Parsi community. <sup>[3]</sup> In PD, degeneration primarily involves the dopamine-producing neurons in the basal ganglia. PD is characterized by the cardinal features of rigidity, bradykinesia,

resting tremor and postural instability. PD individuals were also affected by a range of non-motor symptoms including autonomic dysfunction, cognitive and psychiatric changes, sensory symptoms and sleep disturbance. <sup>[4]</sup> Cognitive deficits in PD include impaired regulation in sorting or planning tasks. Movement Strategies Training (MST) teaches the individuals with PD to use their frontal cortex to move more easily, safely and quickly using cognitive

control. [5] It teaches individuals how to cope with their movement disorder by using attention, cues, environment adaptation, part practice and mental rehearsal. [5] Walking in a environment required to do planning and navigational skills. So, the motor activity further reduced when they perform the dualtask which is essential in daily activity.

There is some limited research on cognitive aspect which is required to enhance the motor action for day to day activity. The aim of the study was to study the effects of Movement strategies Training on motor function, cognitive function, and balance in individuals with PD.

## **MATERIALS AND METHODS**

**Participants:** This study is a randomized control study, which includes pre-interventional post-interventional after 8 weeks and after 2 month follow up evaluation. Ten idiopathic PD individuals who participated in the intervention were recruited from the medicine and neuro physiotherapy department, Pravara Institute of Medical Sciences, Loni (Bk)-413 736, Taluka Rahata, District Ahmednagar, Maharashtra State, India. Study received an ethical clearance from the Institutional Ethical Committee.

### **Inclusion criteria:**

1. Both male and female with age ranges from 50 to 80 years.
2. Clinical diagnosis of idiopathic PD.
3. A stable PD on medication regime throughout the 8 weeks study period,
4. Modified Hoehn and Yahr stage II or III.
5. Mild to moderate cognitive impaired.
6. Willing to participate in the study.

### **Exclusion criteria:**

1. Individuals with cardiopulmonary impairments like orthostatic hypotension.
2. Visual impairments.

3. Hearing loss.
4. Recurrent history of fall (once/week).

The informed consent was obtained from the participants before they were enrolled into the intervention. The participants included in the study were then randomly assigned either to the study group (MST group) or to the control group (conventional physiotherapy).

### **Outcome measures**

1. Unified Parkinson's Disease Rating Scale (UPDRS) [6]
2. Mini Mental State Examination (MMSE) [7]
3. Timed up and go test (TUG) [8]

### **Intervention:**

All Individuals were then randomly selected and divide into two groups. Group A (Study group) contained 5 individuals who received conventional physiotherapy along with MST for 60 minutes with rest interval in between. Group B (Control group) contained 5 individuals who received only conventional physiotherapy for 60 minutes with rest interval in between.

### **Movement Strategy Training (MST): [9]**

1. Sitting: In sitting individuals were asked to perform finger counting 10 repetitions for each hand, hand open & close (10 repetitions). By using cue cards individual were asked to read the instruction written on card loudly, color string beads activity.
2. Sit to Stand: Emphasis on how to get up from chair.
3. Turning: Individuals were asked to turn 180 or 360, clock/ anti clockwise direction.
4. Walking: Individuals were asked to walk with visual or movement strategies, auditory cues that correct step size, length along with cognitive exercise like, word recitation, digit subtraction.

5. Obstacle Negotiation: Individuals were asked to walk with some obstacles (i.e. plastic cones) using cues and clues. Eg. first go to number. 2 and take a 180 degree turn, go to number. 3 count backward numbers 20-10, go to number. 4 do marching recall the words that already done in reaching in standing.

Individuals were asked to perform cognitive task: Sit in chair and pick up the one paper and color pen from chair read it, solve the puzzles, solve trial making test sheet. MST progression can be made by adding complex activity.

**Conventional Physiotherapy Programme:**  
[4, 10, 11]

1. Relaxation exercises
2. Flexibility exercises
3. Postural exercise
4. Balance retraining
5. Gait retraining

**DATA ANALYSIS AND RESULTS**

Data were analyzed using trial version GraphPadInstat software 3.10. The

data were entered into an excel spread sheet, tabulated and subjected to statistical analysis. Various statistical measures used for this study which includes mean, standard deviation (SD) and test of significance such as unpaired ‘t’ test.

Demographic variables between the groups were evaluated by unpaired ‘t’ test (Table 1) Analysis of variance (ANOVA) using repeated measure test was used to compare the differences of scores of pre-intervention, after 8 weeks and after 2 months of follow up within a single group. ANOVA test was used for UPDRS, MMSE and TUG (Table 2). Unpaired ‘t’ test was used to compare the differences between the two groups i.e. the study group (Group A) and the control group (Group B) (Table 3). For this purpose, data was collected by the primary investigator and the comparison of scores was made between the pre, after 8 weeks and after 2 month follow up. The results were concluded to be statistically significant with  $p < 0.05$  and highly significant with  $p < 0.01$ . The results after 8 weeks shows that MST is an effective training programme in comparison with pre intervention results and 2 month follow up results.

**Table 1: Demographic and clinical characteristics**

|                          | Group A (Study group)      | Group B (Control group)    | ‘p’ value         |
|--------------------------|----------------------------|----------------------------|-------------------|
| Age (Years)              | 56.6±7.6 <sup>a</sup>      | 58.4±8.6 <sup>a</sup>      | 0.7 <sup>c</sup>  |
| Gender                   | 3(60%)/2(40%) <sup>b</sup> | 4(80%)/1(20%) <sup>b</sup> | -                 |
| H & Y Stage              | 2.7±0.4 <sup>a</sup>       | 2.5±0.5 <sup>a</sup>       | 0.52 <sup>c</sup> |
| Disease Duration (Years) | 8±2.12 <sup>a</sup>        | 7.6±2.3 <sup>a</sup>       | 0.78 <sup>c</sup> |
| Dosage (mg)              | 130.5±20.4 <sup>a</sup>    | 131.25±25.3 <sup>a</sup>   | 0.81 <sup>c</sup> |

Where: <sup>a</sup> . Values expressed as Mean±Standard Deviation  
<sup>b</sup> . Values expressed in Percentage  
<sup>c</sup> . Analyzed by Student unpaired ‘t’ test

**Table 2: Intra group comparison of UPDRS, MMSE, TUG scores of pre, after 8 weeks and after 2 month follow up of intervention in both groups. (n=5 each group)**

|       | Group   | Pre intervention value (Mean±S.D) | Post intervention value after 8 weeks (Mean±S.D) | Intervention value after 2 month follow up (Mean±S.D) | 'p' value           | Result             |
|-------|---------|-----------------------------------|--------------------------------------------------|-------------------------------------------------------|---------------------|--------------------|
| UPDRS | Group A | 86.6±11.82                        | 76±8.94                                          | 69±10.24                                              | <0.001 <sup>a</sup> | Highly Significant |
|       | Group B | 88.6±13.5                         | 81±10.84                                         | 85±11.85                                              | <0.001 <sup>a</sup> | Highly Significant |
| MMSE  | Group A | 21.6±3.43                         | 25.8±0.83                                        | 26±3.20                                               | <0.001 <sup>a</sup> | Highly Significant |
|       | Group B | 19.4±1.3                          | 20.8±0.8                                         | 20.8±0.8                                              | <0.05 <sup>a</sup>  | Significant        |
| TUG   | Group A | 40±44.8                           | 25.2±19.94                                       | 30.1±22.5                                             | <0.001 <sup>a</sup> | Highly Significant |
|       | Group B | 46±41.44                          | 45.2±40.2                                        | 46±41.2                                               | <0.001 <sup>a</sup> | Highly Significant |

Where: <sup>a</sup> . Analyzed by ANOVA test

**Table 3: Inter group comparison of UPDRS, MMSE, TUG scores of pre, after 8 weeks and after 2 month follow up of intervention between Group A and Group B**

|       |                              | Group A (Mean±S.D) | Group B (Mean±S.D) | 't' value | 'p' value | Result          |
|-------|------------------------------|--------------------|--------------------|-----------|-----------|-----------------|
| UPDRS | Pre to 8 weeks               | 10.6±2.88          | 7±1.3              | 1.61      | 0.05a     | Significant     |
|       | 8 weeks to 2 month follow up | 7±2.6              | 8±4.14             | 0.51      | 0.31 a    | Not significant |
| MMSE  | Pre to 8 weeks               | 4.2±2.6            | 1.4±0.5            | 2.36      | 0.05 a    | Significant     |
|       | 8 weeks to 2 month follow up | 1.6±0.6            | 2.0±0.4            | 2.26      | 0.03 a    | Significant     |
| TUG   | Pre to 8 weeks               | 14.8±2.5           | 4.9±3.5            | 0.95      | 0.18 a    | Not Significant |
|       | 8 weeks to 2 month follow up | 7±11.5             | 6.2±13.9           | 0.09      | 0.46 a    | Not Significant |

Where: <sup>a</sup> . Analyzed by Unpaired 't' test

## DISCUSSION

### 1. Unified Disease Parkinson's Disease Rating Scale (UPDRS):

Motor response was measured by UPDRS. Study shows that there was more improvement in group A from pre to 8 weeks. Walking is one component in UPDRS. The use of external cues and cognitive strategies are the therapist's main training options for gait hypokinesia. The research literature provides considerable evidence that visual cues (eg, white lines on the floor spaced at step lengths suitable for the person's age and height) normalize the spatial and temporal variables of gait. <sup>[12]</sup> Mechanism behind MST was

it improves the performance of transfer. <sup>[9, 13]</sup> In this strategy, complex automated movements are transferred into series of sub movements that have to be executed in a fixed order. There are two mechanism by which MST works; internal cue control through the basal ganglia and via motor cortex. Cues in fMRI study revealed that increase in brain activation and was increased arousal state of brain. <sup>[9]</sup> Cues are stimuli from environment or generated by patients. Cues can be divided into, Visual cues: Strips of blue tape on the floor, <sup>[14]</sup> Colored cones targets at eye level, Cue cards for cognitive tasks. Auditory:

counting (by patient and therapist), finger tapping, clapping. [14] Tactile cues: tapping on the hip or leg.

## 2. Mini Mental State Examination (MMSE):

Individuals with PD commonly have cognitive impairments. These include mild impairments early in the disease process and severe impairments and dementia in the late stages. [15] Cognitive exercise

programs, particularly those that focus on improving executive functioning, have the potential to help individuals with PD maintain a higher level of adaptive living skills and quality of life. People with cognitive impairment might well benefit more from external cues.

## 3. Timed Up and Go Test (TUG):

Exercises improving proprioceptor input in individuals with PD. Both groups were given balance exercises are standing with eyes open and close, single leg standing with or without support, in addition to cognitive task were given word recitation, digit subtraction.

## CONCLUSION

The present study suggest that Movement Strategies Training is an effective in improving motor control, cognitive function and balance in individuals with PD and it can be used as complementary or adjunctive intervention in the management of PD.

*Limitations of the present study:* This study included only a limited sample size, individuals with secondary parkinsonism, and Severe cognitive impaired individuals were not included.

*Suggestions for future research:* Future study with a broader sample of individuals with Parkinson's disease, individual quality of life can be assessed by using PDQ39.

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