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Sunayana Ghosh Dostider

Assistant Professor,
Department of Physiotherapy,
School of Allied Health, Swami
Vivekananda University, West
Bengal, India

Balance rehabilitation treatment in patients with parkinson's disease: A randomized controlled pilot study

Sunayana Ghosh Dostider

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Abstract

Background: Parkinson's disease (PD) is a progressive neurologic disorder characterized by motor symptoms, including balance impairment, which increases the risk of falls and affects quality of life.

Objective: This randomized controlled pilot study aimed to evaluate the effectiveness of a balance confidence in daily activities.

Conclusion: This pilot study indicates that a targeted balance rehabilitation program can effectively enhance both static and dynamic balance in patients with PD. Larger-scale randomized trials are necessary to validate these findings and develop evidence-based treatment protocols.

Keywords: Parkinson's disease, balance rehabilitation, fullerton advanced balance scale, multi-directional reach test, randomized controlled trial

Introductions

Parkinson's disease (PD) is a progressive neurodegenerative disorder marked by dopamine depletion in the substantia nigra. This results in hallmark motor symptoms such as bradykinesia, rigidity, tremor, and postural instability. Among these, balance impairment is one of the most debilitating symptoms, leading to an increased risk of falls and diminished quality of life (Bloem *et al.*, 2015) [16].

Balance deficits in PD arise from a combination of motor and sensory dysfunctions, including impaired postural reflexes and proprioception. These impairments limit adaptive responses to postural challenges, heightening the risk of falls (Horak *et al.*, 2013) [4]. Addressing these deficits is essential to improving mobility and independence.

Physical therapy plays an integral role in managing balance deficits in PD. A targeted rehabilitation program can enhance postural control, reduce fall risk, and improve functional mobility (Tomlinson *et al.*, 2013) [7]. This pilot study investigates the efficacy of a balance rehabilitation program in patients with PD using validated assessment tools.

Methods

Study Design and Participants

This randomized controlled pilot study recruited five patients diagnosed with PD based on the United Kingdom Brain Bank criteria. Inclusion criteria included a history of balance deficits and stable medication use. Participants were randomly assigned to the intervention group (n = 3) or the control group (n = 2).

Intervention

The intervention group underwent a structured balance rehabilitation program comprising five 60-minute sessions weekly for eight weeks. The control group participated in general mobility exercises without a specific focus on balance. The rehabilitation program included:

- **Warm-up (10 minutes):** Light stretching and range of motion exercises.
- **Static Balance Training (20 minutes):** Tandem stance, single-leg standing, and exercises on unstable surfaces.
- **Dynamic Balance Training (20 minutes):** Obstacle navigation, step-ups, weight-shifting exercises, and gait training.
- **Cool-down (10 minutes):** Relaxation and breathing exercises.

Corresponding Author:

Sunayana Ghosh Dostider

Assistant Professor,
Department of Physiotherapy,
School of Allied Health, Swami
Vivekananda University, West
Bengal, India

Outcome Measures

Balance was assessed at baseline and after eight weeks using:

- **Fullerton Advanced Balance (FAB) Scale:** Evaluates static and dynamic balance with a maximum score of 40.
- **Multi-directional Reach Test (MDRT):** Measures reach distance in anterior, posterior, and lateral directions.

Results

FAB Scale: The intervention group demonstrated significant improvements in FAB scores (baseline mean: 20/40; post-treatment mean: 32/40). The control group showed negligible changes (baseline mean: 22/40; post-treatment mean: 24/40).

MDRT Scores

The intervention group exhibited notable increases in reach distances (mean):

- **Anterior Reach:** Baseline: 6.5 inches; Post-treatment: 9 inches.
- **Posterior Reach:** Baseline: 2.5 inches; Post-treatment: 5 inches.
- **Lateral Reach (Right):** Baseline: 5 inches; Post-treatment: 7.5 inches.
- **Lateral Reach (Left):** Baseline: 5.2 inches; Post-treatment: 7 inches.

The control group displayed minor improvements across all directions (Mean).

- **Anterior Reach:** Baseline: 6.9 inches; Post-treatment: 7.2 inches.
- **Posterior Reach:** Baseline: 3.2 inches; Post-treatment: 3.9 inches.
- **Lateral Reach (Right):** Baseline: 4.7 inches; Post-treatment: 5.1 inches.
- **Lateral Reach (Left):** Baseline: 5 inches; Post-treatment: 5.5 inches.

Participant Feedback

Participants in the intervention group reported enhanced confidence and reduced unsteadiness during daily activities. No adverse effects were noted in either group.

Discussion

Clinical Implications

This pilot study supports the effectiveness of targeted balance rehabilitation in PD. The intervention group's significant improvements in FAB and MDRT scores suggest enhanced static and dynamic postural control. These findings are consistent with prior research, highlighting the benefits of balance-specific physical therapy (Conradsson *et al.*, 2012) [2].

Mechanisms of Improvement

Enhanced proprioception, sensory integration, and anticipatory postural adjustments likely contributed to the observed improvements. Progressive exercise difficulty ensured safe and effective skill acquisition.

Study Limitations: The small sample size and lack of blinding limit the generalizability of findings. Larger,

blinded randomized trials are needed to confirm these results and explore the long-term benefits of balance rehabilitation.

Conclusion

This randomized controlled pilot study suggests that a structured balance rehabilitation program can effectively improve static and dynamic balance in patients with PD. The significant functional gains observed in this study emphasize the need for incorporating balance training into standard physiotherapy protocols for PD management. Further research with larger cohorts is essential to validate these findings and refine treatment guidelines.

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