RESEARCH PAPER

Effectiveness of Task-Based Lee Silverman Voice Treatment BIG on Functional Gait Performance, Freezing of Gait, and Quality of Life in Parkinson's Disease

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Abstract:
Background: Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by gait impairment, freezing of gait, and reduced quality of life. Although Lee Silverman Voice Treatment BIG (LSVT BIG) has demonstrated benefits in improving motor function, evidence regarding the effectiveness of a task-based LSVT BIG approach remains limited.
Objective: To evaluate the effectiveness of Task-Based LSVT BIG compared with conventional physiotherapy in improving functional gait performance, reducing freezing of gait, and enhancing quality of life in individuals with Parkinson's disease.
Methods: A quasi-experimental study was conducted among 27 individuals with clinically diagnosed Parkinson's disease (Hoehn and Yahr stages I–III). Participants were allocated into a Task-Based LSVT BIG group (n = 14) or a conventional physiotherapy group (n = 13) using convenience sampling. Both groups received supervised intervention for 4 weeks (60 minutes/session, four sessions/week). Outcome measures included the Functional Gait Assessment (FGA), Freezing of Gait Questionnaire (FOG-Q), and Parkinson's Disease Questionnaire-39 (PDQ-39). Two participants withdrew during the intervention, and data from 25 participants (Task-Based LSVT BIG, n = 13; conventional physiotherapy, n = 12) were analysed. Within-group and between-group comparisons were performed to determine treatment effectiveness.
Results: Both groups demonstrated significant improvements following the intervention ($p < 0.001$). However, the Task-Based LSVT BIG group showed significantly greater improvements than the conventional physiotherapy group. Mean FGA scores improved from 18.85 ± 1.99 to 22.00 ± 2.00, FOG-Q scores decreased from 15.69 ± 2.10 to 6.77 ± 1.01, and PDQ-39 scores improved from 53.11 ± 8.99 to
21.45 ± 4.80. Between-group analysis also demonstrated significantly greater improvements in functional gait performance, freezing of gait, and quality of life in the Task-Based LSVT BIG group ($p < 0.001$). **Conclusion:** Task-Based LSVT BIG was more effective than conventional physiotherapy in improving functional gait performance, reducing freezing of gait, and enhancing quality of life in individuals with Parkinson's disease. Incorporating task-oriented, high-amplitude movement training into rehabilitation programmes may improve functional outcomes and support greater independence in daily activities.
Keywords: Parkinson's disease; LSVT BIG; task-based rehabilitation; functional gait assessment; freezing of gait; quality of life; physiotherapy; neurorehabilitation.
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Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disorder and one of the fastest-growing causes of neurological disability worldwide. It affects approximately 2–3% of individuals aged over 65 years, and its prevalence is expected to double by 2040 due to population ageing. According to the Global Burden of Disease study, PD contributes substantially to disability, mortality, and healthcare costs worldwide. In India, the age-adjusted prevalence has been reported to be approximately 76 per 100,000 population.

PD is characterized by progressive degeneration of dopaminergic neurons in the substantia nigra, resulting in dopamine deficiency and dysfunction of the basal ganglia. The cardinal motor manifestations include resting tremor, bradykinesia, rigidity, and postural instability, while non-motor symptoms such as cognitive impairment, mood disorders, autonomic

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dysfunction, and sleep disturbances further contribute to disability. Among the disabling motor complications, freezing of gait (FOG) is one of the most challenging symptoms, characterized by brief episodes of inability to initiate or continue walking. FOG significantly increases the risk of falls, reduces mobility, limits independence, and adversely affects quality of life.

Exercise-based rehabilitation has emerged as an essential component of PD management because of its ability to promote neuroplasticity, facilitate motor learning, and improve functional performance. Conventional physiotherapy interventions include gait training, balance exercises, strengthening, flexibility training, treadmill training, virtual reality, robotic rehabilitation, and wearable-assisted therapies. Among the available rehabilitation approaches, Lee Silverman Voice Treatment BIG (LSVT BIG) is an evidence-based, amplitude-oriented intervention that emphasizes high-amplitude, intensive movements to improve gait, balance, and functional mobility through repetitive practice and sensory recalibration.

Previous studies have demonstrated the effectiveness of LSVT BIG in improving motor function in individuals with Parkinson's disease. Riya Chogle et al. (2020) reported significant improvements in functional mobility and gait performance following LSVT BIG intervention. More recently, Youngcheok Choi et al. (2022) demonstrated that Task-Based LSVT BIG, which incorporates meaningful functional activities into amplitude-based movement training, significantly improved hand function, activities of daily living, psychological well-being, and quality of life.

Despite these encouraging findings, evidence regarding the effectiveness of Task-Based LSVT BIG in improving functional gait performance, reducing freezing of gait, and enhancing quality of life remains limited when compared with conventional physiotherapy. As task-specific, high-amplitude training has the potential to improve movement planning, coordination, and performance during activities of daily living, further investigation is warranted to establish its clinical effectiveness.

Functional gait performance, freezing of gait, and disease-specific quality of life can be reliably evaluated using the Functional Gait Assessment (FGA), Freezing of Gait Questionnaire (FOG-Q), and Parkinson's Disease Questionnaire-39 (PDQ-39), respectively. Therefore, the present study aimed to evaluate the effectiveness of Task-Based Lee Silverman Voice Therapy BIG (LSVT BIG) compared with conventional physiotherapy in improving functional gait performance and quality of life among individuals with Parkinson's disease. It was hypothesized that participants receiving Task-Based LSVT BIG would demonstrate greater improvements in functional gait performance and quality of life than those receiving conventional physiotherapy.

Methodology

The present study will adopt an experimental study design using a convenience sampling method. A total of 25 participants diagnosed with Parkinson's disease will be recruited from Life Health Care Multispeciality Rehabilitation Centre, Mogappair. The intervention will be administered over a period of four weeks, with four sessions per week. Participants will include clinically diagnosed Parkinson's disease patients of both sexes, aged 35–80 years, with Hoehn and Yahr stages I–III, Mini-Mental State Examination (MMSE) score >24, Freezing of Gait Questionnaire (FOG-Q) Item 3 score >0, Functional Gait Assessment (FGA) score between 15 and 22, no requirement for walking aids, and willingness to participate. Individuals with other neurological or musculoskeletal disorders affecting mobility, cognitive impairment, auditory or visual deficits, Beck Depression Inventory score >28, cardiovascular conditions contraindicating one-hour exercise sessions, or unwillingness to participate will be excluded. Outcome measures will include the Functional Gait Assessment (FGA) to evaluate gait performance, the Freezing of Gait Questionnaire (FOG-Q) to assess freezing episodes, and the Parkinson's Disease Questionnaire-39 (PDQ-39) to measure quality of life.

Procedure

A total of 30 participants with Parkinson's disease were screened, of whom 27 participants met the inclusion and exclusion criteria and were enrolled in the study. Baseline screening was performed using the Mini-Mental State Examination (MMSE) and Beck Depression Inventory (BDI). After obtaining written informed consent, participants were allocated into two groups using convenience sampling. Group A (n = 14) received Task-Based Lee Silverman Voice Therapy BIG (LSVT BIG), whereas Group B (n = 13) received Conventional Physiotherapy. Prior to the intervention, all participants were assessed using the Functional Gait Assessment (FGA), Freezing of Gait Questionnaire (FOG-Q), and Parkinson's Disease Questionnaire-39 (PDQ-39).During the intervention period, one participant from Group A withdrew due to personal reasons, and one participant from Group B withdrew due to health-related issues. The remaining participants completed the intervention programme for 4 weeks, comprising 4 sessions per week, with each session lasting approximately 60 minutes.

At the end of the intervention period, all participants were reassessed using the same outcome measures (FGA, FOG-Q, and PDQ-39). The pre- and post-intervention scores were statistically analysed to determine the effectiveness of the interventions.

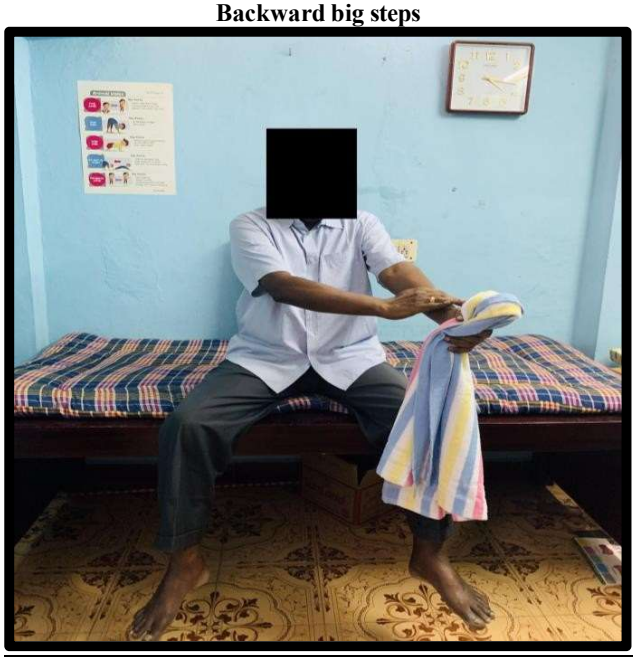
Intervention Protocol

Group A – Task-Based LSVT BIG

Stage	Intervention	Dosage
Maximal Daily Exercises	Floor-to-ceiling, Side-to-side, Forward BIG Steps, Sideward BIG Steps, Backward BIG Steps, Forward Rock-and-Reach, Sideward Rock-and-Reach	8–10 repetitions
Functional Component Tasks	Bathing, Cleaning, and Bowling-related functional activities	5 tasks × 5 repetitions
Hierarchical Tasks	Task-specific activities of daily living (Bathing, Cleaning, and Bowling)	10 minutes
BIG Walking	High-amplitude walking practice	5 minutes

Intervention Duration: 1 hour per session, 4 sessions per week for 4 weeks.

Backward big steps



Motion of holding a towel and applying soap on the body Group B -Conventional Physiotherapy

Participants received a conventional physiotherapy program consisting of:

- Relaxation exercises
- Mat exercises (neck, trunk, and lower-limb mobility)
- Sitting exercises
- Standing balance and strengthening exercises
- Functional gait and stepping exercises

Intervention Duration: 1 hour per session, 4 sessions per week for 4 weeks.

Arm reaching

Sideways arm stretches

Results

Participant Characteristics:

Thirty participants with Parkinson's disease were screened for eligibility. Of these, 27 participants met the inclusion criteria and were enrolled in the study. During the intervention period, one participant from the Task-Based LSVT BIG group withdrew due to personal reasons and one participant from the conventional physiotherapy group withdrew because of health-related issues. Consequently, data from 25 participants (Task-Based LSVT BIG, n = 13; Conventional Physiotherapy, n = 12) were included in the final analysis.

Baseline Characteristics

The baseline descriptive statistics for the Functional Gait Assessment (FGA), Freezing of Gait Questionnaire (FOG-Q), and Parkinson's Disease Questionnaire-39 (PDQ-39) are presented in Table 1. The two groups demonstrated comparable baseline scores across all outcome measures.

Within-Group Analysis

The Task-Based LSVT BIG group demonstrated significant improvements in all outcome measures following the four-week intervention. The mean FGA score increased from 18.85 ± 1.99 to 22.00 ± 2.00 ($t = -16.51$, $p < 0.001$). The mean FOG-Q score decreased from 15.69 ± 2.10 to 6.77 ± 1.01 ($t = 18.34$, $p < 0.001$), while the mean PDQ-39 score decreased

from 53.11 ± 8.99 to 21.45 ± 4.80 (t = 19.55, p < 0.001). Similarly, the conventional physiotherapy group demonstrated significant within-group improvements. The mean FGA score increased from 19.00 ± 1.95 to 19.67 ± 2.10 (t = −4.69, p < 0.001). The mean FOG-Q score decreased from 13.75 ± 1.71 to 12.50 ± 1.73 (t = 9.57, p < 0.001), and the mean PDQ-39 score decreased from 50.03 ± 3.61 to 43.71 ± 3.11 (t = 7.60, p < 0.001).

Between-Group Analysis

Between-group comparison revealed significantly greater improvements in the Task-Based LSVT BIG group than in the conventional physiotherapy group for all outcome measures. The mean improvement in FGA was 3.15 ± 0.69 in the Task-Based LSVT BIG group compared with 0.67 ± 0.49 in the conventional physiotherapy group (t = 10.31, p < 0.001). The reduction in FOG-Q scores was significantly greater in the Task-Based LSVT BIG group (8.92 ± 1.75) than in the conventional physiotherapy group (1.25 ± 0.45) (t = −14.69, p < 0.001). Likewise, the reduction in PDQ-39 scores was significantly greater in the Task-Based LSVT BIG group (31.65 ± 5.84) compared with the conventional physiotherapy group (6.32 ± 2.88) (t = −13.57, p < 0.001).

Summary of Findings

Both intervention groups demonstrated statistically significant improvements in functional gait performance, freezing of gait, and quality of life following the intervention. However, participants who received Task-Based LSVT BIG exhibited significantly greater improvements than those who received conventional physiotherapy across all outcome measures.

Table 1. Baseline and post-intervention scores (Mean ± SD)

Outcome Measure	Task-Based LSVT BIG (n = 13)	Conventional Physiotherapy (n = 12)
FGA	18.85 ± 1.99 → 22.00 ± 2.00	19.00 ± 1.95 → 19.67 ± 2.10
FOG-Q	15.69 ± 2.10 → 6.77 ± 1.01	13.75 ± 1.71 → 12.50 ± 1.73
PDQ-39	53.11 ± 8.99 → 21.45 ± 4.80	50.03 ± 3.61 → 43.71 ± 3.11

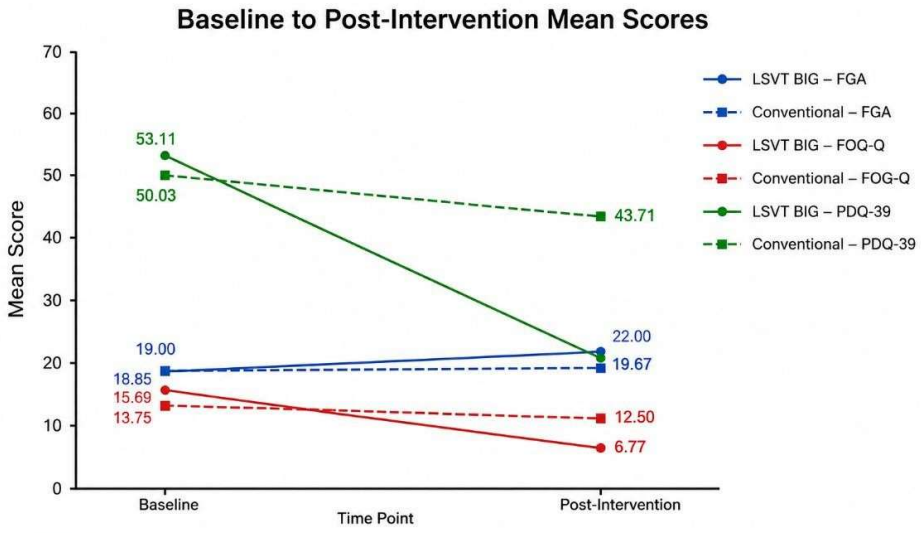


Figure 2. Comparison of baseline and post-intervention mean scores for the Functional Gait Assessment (FGA), Freezing of Gait Questionnaire (FOG-Q), and Parkinson's Disease Questionnaire-39 (PDQ-39) between the Task-Based LSVT BIG and Conventional Physiotherapy groups.

Table 2. Between-group comparison of change scores

Outcome Measure	Task-Based LSVT BIG	Conventional Physiotherapy	t	p
FGA Improvement	3.15 ± 0.69	0.67 ± 0.49	10.31	<0.001
FOG-Q Reduction	8.92 ± 1.75	1.25 ± 0.45	−14.69	<0.001
PDQ-39 Reduction	31.65 ± 5.84	6.32 ± 2.88	−13.57	<0.001

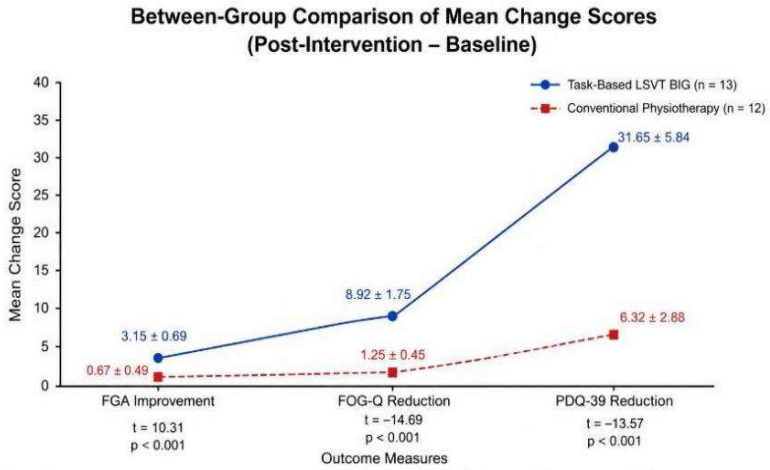


Figure. Between-group comparison of mean change scores (Post-Intervention – Baseline) for Functional Gait Assessment (FGA) improvement, Freezing of Gait Questionnaire (FOG-Q) reduction, and Parkinson's Disease Questionnaire-39 (PDQ-39) reduction. Independent t-test was used for between-group comparisons. Statistically significant at $p < 0.001$.

Discussion

The present study investigated the effectiveness of Task-Based Lee Silverman Voice Therapy BIG (LSVT BIG) compared with conventional physiotherapy in improving functional gait performance, reducing freezing of gait, and enhancing quality of life in individuals with Parkinson's disease. Although both interventions resulted in significant improvements, participants receiving Task-Based LSVT BIG demonstrated significantly greater improvements across all outcome measures.

The superior outcomes observed with Task-Based LSVT BIG may be attributed to its emphasis on high-amplitude, task-specific movements combined with intensive repetition and continuous sensory feedback. These principles facilitate motor learning, improve movement perception, and promote sensory recalibration, thereby enhancing gait performance and functional mobility. The present findings are consistent with those of Chogle et al., who reported significant improvements in gait performance following LSVT BIG intervention in individuals with Parkinson's disease.

The incorporation of functional and hierarchical tasks into the intervention may have further contributed to the observed improvements by promoting movement planning, postural control, balance, and the transfer of learned motor skills into activities of daily living. Similar findings were reported by Choi et al., who demonstrated that task-based LSVT BIG significantly improved hand function, activities of daily living, psychological function, and quality of life in patients with Parkinson's disease.

Participants in the Task-Based LSVT BIG group also exhibited a greater reduction in freezing of gait compared with the conventional physiotherapy group. Repetitive, high-amplitude task practice may improve gait initiation and motor automaticity, thereby reducing freezing episodes. Furthermore, the significant improvement in PDQ-39 scores indicates that enhanced mobility and reduced gait impairment translated into better disease-specific quality of life. These findings are supported by Walter et al., who reported improvements in mobility, functional performance, and psychological well-being following LSVT BIG intervention.

Although conventional physiotherapy produced significant improvements, the magnitude of change was considerably smaller than that observed with Task-Based LSVT BIG. Conventional rehabilitation primarily focuses on flexibility, strengthening, and general mobility, whereas Task-Based LSVT BIG specifically targets amplitude scaling and task-oriented functional movements that address the motor deficits characteristic of Parkinson's disease.

Overall, the findings suggest that Task-Based LSVT BIG is a more effective rehabilitation approach than conventional physiotherapy for improving gait performance, reducing freezing of gait, and enhancing quality of life in individuals with Parkinson's disease. These results support its incorporation into routine neurorehabilitation programmes to improve functional independence and long-term clinical outcomes.

Limitations

- The study was limited by a small sample size, a short intervention duration (4 weeks), and the absence of long-term follow-up.
- Objective spatiotemporal gait parameters (e.g., cadence, step length, and stride length) were not assessed.

Future Recommendations

- Future studies should include larger sample sizes, extended follow-up periods, and objective gait analysis to validate the long-term effectiveness of Task-Based LSVT BIG.
- Further research is warranted to explore its application in other neurological populations.

Conclusion:

Task-Based LSVT BIG was more effective than

conventional physiotherapy in improving functional gait, reducing freezing of gait, and enhancing quality of life in individuals with Parkinson's disease. Significant improvements in FGA, FOG-Q, and PDQ-39 scores support its clinical effectiveness.

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