



# Impact of Lee Silverman Voice Therapy (LSVT) Big Exercises on Motor Disability, Posture and Functional Gait Performance of Parkinson's Disease Patients: A Systematic Review

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**Background:** Parkinson's disease (PD) is a progressive neurodegenerative disorder marked by motor symptoms such as bradykinesia, rigidity, tremor, and postural instability. Gait disturbances and balance impairments significantly reduce quality of life and are often resistant to pharmacological treatment. The Lee Silverman Voice Treatment (LSVT) BIG program, an amplitude-focused physical therapy, has emerged as a potential intervention to address these deficits. **Objective:** This systematic review aims to evaluate the effectiveness of LSVT BIG therapy in improving motor disability, posture, and functional gait performance in individuals with PD. **Methods:** Following PRISMA guidelines, a comprehensive literature search was conducted across PubMed, Scopus, Embase, Web of Science, and Cochrane Library. Studies were included if they assessed LSVT BIG interventions in PD patients and reported outcomes on motor function, posture, or gait. Eleven studies met the inclusion criteria, including randomized controlled trials, experimental studies, and case reports. **Results:** Across the studies, LSVT BIG therapy demonstrated consistent improvements in gait parameters (stride length, velocity), balance (postural control, reduced fall risk), and functional mobility (Timed Up and Go, Functional Gait Assessment). Some studies reported sustained benefits over time and enhancements in patient-reported outcomes such as quality of life and confidence in movement. Modified protocols, including home-based and telerehabilitation approaches, were also effective, though standard intensive formats showed superior results in some cases. **Conclusion:** LSVT BIG is a promising non-pharmacological intervention for managing motor symptoms and enhancing functional mobility in PD. Its basis in neuroplasticity and motor learning principles allows for meaningful improvements in both clinical and patient-reported outcomes. Future large-scale and long-term studies are warranted to further validate these findings and optimize intervention protocols.

**Keywords:** Parkinson's Disease, LSVT BIG, Motor Disability, Gait Performance, Postural Instability, Neuro-rehabilitation, Amplitude-Based Training, Functional Mobility, Balance, Physical Therapy

## Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder primarily affecting the motor system due to the loss of dopaminergic neurons in the substantia nigra pars compacta of the brain. First described by James Parkinson in 1817 as the "shaking palsy," the disease is characterized by a range of motor symptoms that significantly impair an individual's ability to perform daily activities.<sup>[1]</sup>

The hallmark motor features of PD include bradykinesia (slowness of movement), resting tremor, muscular rigidity, and postural instability.<sup>[2]</sup> These symptoms often begin asymmetrically and progress gradually, leading to increased disability over time. Motor disability in PD is not only a result of primary motor symptoms but also includes gait disturbances, freezing of gait (FOG), and decreased fine motor control, which can severely impact balance, coordination, and independence.<sup>[3]</sup> The pathophysiology of motor disability in PD is closely linked to the dopaminergic deficit in the basal ganglia circuitry, which plays a key role in regulating voluntary movement. As dopamine levels decline, the normal functioning of motor pathways is disrupted, resulting in the characteristic motor impairments.<sup>[4]</sup>

Postural instability in PD often manifests as impaired balance control, leading to a stooped posture and increased risk of falls. Gait disturbances typically include shuffling steps, reduced arm swing, festination (progressive quickening of steps), and freezing of gait (FoG), where the patient temporarily feels as if their feet are glued to the floor.<sup>[5]</sup> These features usually become more pronounced as the disease progresses and may not respond well to dopaminergic medications, making them challenging to manage clinically.<sup>[6]</sup>

The Lee Silverman Voice Treatment (LSVT) programs are evidence-based therapy techniques originally developed to improve vocal loudness in individuals with Parkinson's disease. The most widely known program, LSVT LOUD, focuses on increasing vocal intensity and clarity through intensive, high-effort voice exercises. A complementary program, LSVT BIG, applies similar principles to physical movement, aiming to improve amplitude (size) of body movements, particularly in those with Parkinson's disease or related motor impairments. LSVT exercises are delivered in an intensive format-typically four sessions per week for four weeks-and emphasize consistent, high-effort practice. These programs are grounded in principles of motor learning and neuroplasticity, promoting lasting changes in motor function through repetitive, task-specific training.

The LSVT BIG (Lee Silverman Voice Treatment BIG) program is a research-based exercise protocol designed to improve motor function in individuals with Parkinson's disease (PD). It focuses on amplitude-based movement training, encouraging patients to make large, exaggerated movements to counteract the small, slow movements characteristic of PD. 1. LSVT BIG helps improve gross motor skills, gait, and balance. Patients often report better limb coordination and faster walking speeds.<sup>[7]</sup> 2. Gait and Balance are Improved due to it. Research shows significant improvement in stride length, gait velocity, and postural stability after LSVT BIG training.<sup>[8]</sup> 3. Enhanced Quality of Life Patients also have reported increased confidence in movement, reduction in fall risk, and better ability to perform daily activities.<sup>[9]</sup> 4. Neuroplasticity Promotion is enhanced by LSVT BIG such as neuroplastic changes, encouraging new motor pathways to compensate for the loss of dopaminergic neurons.<sup>[10]</sup>

## Method

### 1. Study design

This systematic review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to evaluate the efficacy and role of Lee Silverman Voice Treatment (LSVT) in individuals with Parkinson's disease (PD).

### 2. Search Strategy

A comprehensive literature search was performed in electronic databases including PubMed, Scopus, Web of Science, Embase, and Cochrane Library. Keywords and MeSH terms such as "Parkinson's disease," "LSVT," "Lee Silverman Voice Treatment," "Motor Disability", "Postural Instability" "Neuro-Rehabilitation" "Amplitude Based Training" and "voice treatment" were used in combination with Boolean operators (AND/OR).

### 3. Eligibility Criteria

#### \* Inclusion criteria:

- Studies involving individuals diagnosed with Parkinson's disease.
- Randomized controlled trials (RCTs), cohort studies, case series, and clinical trials.

#### \* Exclusion criteria:

- Studies not involving LSVT as an intervention.
- Review articles, conference abstracts, editorials, or letters to the editor.
- Non-English publications.

## 4. Data Extraction

50 studies screened titles and abstracts. Full texts of potentially relevant studies were assessed against inclusion criteria. Data extracted included study design, sample size, patient demographics, intervention details, outcomes measured, and main findings. 11 studies are assessed with full text reading and met inclusion criteria are included in this review.

Author, Journal, year	objective	Design	Characteristics of participants sample size	Method	Outcome measures	Results
2014	The aim of the present case series was to explore possible beneficial effects of LSVT BIG training on gait, balance, bed mobility, and dexterity	Case series	3 individuals Aged between 50 to 70	Three patients with mild to moderate PD (all male; aged 52, 54, and 70 years; Hoehn & Yahr stages I-III) completed a 4-week LSVT BIG training program (16 individual 1-hour sessions) and an intensive home training program in accordance with the LSVT BIG protocol. Two certified LSVT BIG physical therapists delivered the LSVT BIG training sessions.	Functional Gait Assessment (FGA), Functional Reach Test (FRT), Timed "Up & Go" Test (TUG), Freezing of Gait Questionnaire (FOGQ), motor score on part III of the Unified Parkinson's Disease Rating Scale (UPDRS III). Bed mobility was addressed using the Lindop Parkinson's Disease Mobility Assessment (LPA).	This case series suggests that the LSVT BIG may be beneficial for gait, balance, and bed mobility.
2015	To compare the effects of Lee Silverman Voice Therapy BIG (LSVT BIG therapy) versus a general exercise program (combined treadmill plus seated trunk and limb exercises) on motor and	Comparative experimental	11 individuals aged between 30 to 90 years	Patients were randomly assigned to receive either general exercise (five patients) or LSVT BIG therapy (six patients). exercise treatments were administered by an	Unified Parkinson's Disease Rating Scale (UPDRS) (total and motor scales), Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), and Modified Fatigue	This study highlights the importance of creating other exercise protocols based on the LSVT BIG therapy that could be as effective for patients that

<p>2015</p>	<p>non-motor symptoms of PD</p> <p>To investigate the amplitude-oriented exercise in Parkinson's disease</p>	<p>Comparative experimental</p>	<p>42 individuals aged between early to late older adults</p>	<p>experienced physical therapist four times a week for four weeks. Both intervention groups received 16 one-hour one to one exercise sessions. After completion of exercise training, the patients in both interventional groups were advised to maintain an active lifestyle and exercise on a regular basis.</p>	<p>Impact Scale (MFIS)</p> <p>UPDRS-III</p>	<p>do not have access to outpatient LSVT BIG therapy.</p>
<p>2017</p>	<p>The purpose of this study was to assess participants functional improvement at a level of minimal clinically important difference (MCID)</p>	<p>Experimental</p>	<p>9 individuals aged between 50 to 80 yrs</p>	<p>LSVT-BIG was compared with a 2-week short protocol (AOT-SP) consisting of 10 sessions with identical exercises in 42 patients with PD.</p> <p>Nine participants with Stage I PD received LSVT BIG 4x/week for 4 weeks followed by bimonthly participation in a community class. Outcome measurement occurred at baseline, after LSVT BIG, and three</p>	<p>Gait Speed, Berg Balance Assessment, Functional Gait Assessment, and Unified Parkinson's Disease Rating Scale Motor Section.</p>	<p>Measures of motor performance were equally improved by LSVT-BIG and AOT-SP but high-intensity LSVT-BIG was more effective to obtain patient-perceived benefit.</p> <p>Eight of nine participants (88.9%) achieved MCID in at least one of the four measures at both after and 3 months after LSVT BIG training indicating</p>

2020	To study the effectiveness of LSVT BIG on functional gait performance of Parkinson's disease patients.	Experimental	32 individuals Diagnosed with parkinson's disease	months after LSVT BIG.  32 clinically diagnosed Parkinson's disease patients selected from Parkinson's disease and movement's disorder society, Mumbai. They were divided into 2 groups, 16 each. Conventional group received conventional rehabilitation program treatment and the experimental group received conventional treatment along with LSVT BIG exercises for 4 weeks. Post intervention gait performance was assessed.	Functional gait performances of both groups were assessed using FOGQ, TUG test and FGA	improvement based on our criteria. Participants in Stage I of PD in this study completed LSVT BIG and demonstrated improved function.  The study results shows that there is a significant improvement in functional gait performance in Parkinson's disease patients after LSVT BIG therapy shown by significant p-values of respective tests.
2020	The purpose of this case series is to describe the impact of LSVT BIG therapy on postural control and gait in three individuals with moderate PD.	Experimental	3 individuals		outcomes, including balance, gait, dual-task performance, quality of life, and balance confidence, were examined after program completion, 1- and 4-months later.	
2021	This study aimed to evaluate the short-term effect of LSVT® BIG on QOL improvement and its retention in a patient with		63-year-old woman	Intervention included 16-18 individual physical therapy sessions, provided within 4 weeks, focused on increasing amplitude of movement and a daily home exercise program.	The Parkinson's Disease Questionnaire -39 (PDQ-	LSVT BIG therapy may improve postural control, gait, and dual-task performance, and therefore reduce fall risk for

<p>2021</p>	<p>PD. Motor symptoms, walking ability, and walking speed were evaluated as factors associated with QOL.</p>	<p>A case study</p>		<p>A 63-year-old woman who was diagnosed with PD received a 4-week LSVT® BIG program under the supervision of certified LSVT® BIG physical therapists. The participant's disease severity was classified as Hoehn and Yahr stage 2.</p>	<p>39), Movement Disorder Society-sponsored Unified Parkinson's Disease Rating Scale (MDS-UPDRS) part 3, timed up-and-go test (TUG), and 10 m walk test (10 MWT) were evaluated before, after, and 1-year after the intervention.</p>	<p>individuals with moderate PD.</p> <p>The results indicated short-term improvements in the PDQ-39, MDS-UPDRS part 3, TUG, and 10 MWT which were retained for up to 1 year.</p>
<p>2021</p>	<p>This study aimed to investigate the effect of Lee Silverman Voice Treatment (LSVT) BIG, an intensified and personalized physiotherapy (INTENSIVE), and a conventional physiotherapy (NORMAL) on NMSs in PD.</p>	<p>Comparative experimental</p>	<p>44 individuals, aged between 35 to 80</p>	<p>Forty-four patients with mild to moderate PD were randomly assigned to one of the three treatment groups. LSVT BIG and INTENSIVE were delivered one-on-one in 16 1-hour sessions within 4 weeks (4x/week). Patients assigned to NORMAL received 16 individual 1-hour sessions within 8 weeks (2x/week). The primary outcome measure was the difference</p>	<p>The primary outcome parameter was the difference in change of Non-Motor Symptoms between treatment groups using the non-motor symptom assessment scale for Parkinson's disease (NMSS) UPDRS part III motor score, chair rising test and a force-measuring gangway. Gait parameters (walking speed and step length) were measured using a 6-meter Leonardo Mechanograph Gangway</p>	<p>ANCOVA (Analysis of Covariance) showed reduced NMSS scores for all groups, with INTENSIVE being superior to NORMAL (<math>p = 0.033</math>). For secondary outcome</p>

<p>2024</p>	<p>This case report aimed to describe and evaluate the influence of LSVT® BIG on the center of pressure (COP) trajectory in a patient with Parkinson's disease (PD).</p>	<p>A case report</p>	<p>67 years old woman</p>	<p>in change from baseline in the non-motor symptom assessment scale for Parkinson's disease (NMSS) between treatment groups to follow up at week 8. Patients were blinded for the NMSS being the primary outcome, but not the different treatment groups.</p>	<p>system (Novotec Medical GmbH, Pforzheim, Germany) The chair rising test was performed on a Leonardo Mechanograph GRFP system (Novotec Medical GmbH, Pforzheim, Germany)</p> <p>Unified Parkinson's Disease Rating Scale (UPDRS) Part 3 were assessed at pre- and post-intervention.</p>	<p>measures (stride length, gait velocity and chair rising test) LSVT BIG and INTENSIVE were both superior to NORMAL.</p>
<p>2024</p>	<p>The aim of study was to compare the effects of synchronous telerehabilitation-based Lee Silverman Voice Treatment® BIG (LSVT® BIG) protocol and progressive structured mobility training in patients with</p>	<p>Experimental comparative</p>	<p>32 patients aged between 40 to 72 years</p>	<p>patient diagnosed with PD at age 59, with a Hoehn and Yahr stage 3 disability severity, underwent a 4-weeks supervised LSVT® BIG program. The total distances of the COP trajectory (two-dimensional [2D] horizontal plane, anterior-posterior [AP] direction, and medial-lateral [ML] direction), and the mean COP velocity for each direction, postural stability,</p> <p>LSVT® BIG (Group 1) and Progressive Structured Mobility Training</p>	<p>Dynamic balance was assessed with Mini-Balance Evaluation Systems Test (Mini-BESTest) as a primary outcome measure. The secondary outcome</p>	<p>The total distances of the COP trajectory, mean COP velocities, and scores of postural stability and posture subsections of the UPDRS Part 3 improved after intervention</p>

	<p>Parkinson's disease (PD).</p> <p>aim was to compare the standard LSVT BIG protocol with a modified LSVT (m-LSVT) BIG protocol (twice a week in the clinic for 4 weeks and twice a week at home for 4 weeks)</p>	<p>Randomized controlled trial</p>	<p>16 individuals with 18 to 80 years</p>	<p>(Group 2) groups. Exercises were performed in both groups for 60 min a day, 4 days a week, for 4 weeks under the supervision of a physiotherapist with synchronous online videoconference method.</p> <p>The LSVT group received standard LSVT BIG training (four times per week for 4 weeks at the clinic). The other group was given m-LSVT BIG exercises, but unlike the LSVT group, the m-LSVT group exercised twice a week at the clinic and twice a week at home for 4 weeks.</p>	<p>measurements were Timed Up and Go Test (TUG), spatiotemporal parameters of gait from Kinovea® software, and postural stability from the Biodex Balance System.</p> <p>The Berg Balance Scale was used to assess functional balance. Biodex Balance System was used to assess laboratory balance measures. Timed Up and Go test and G-Walk sensor system were used to assess functional mobility and spatiotemporal gait analysis.</p>	<p>LSVT® BIG may be preferred to improve dynamic balance, balance confidence, and activity status in the early stages of PD.</p> <p>The results revealed the beneficial effects of the modified protocol on balance and gait in PwPD, as well as the superiority of the standard LSVT BIG protocol.</p>
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## Discussion

This systematic review synthesized evidence from 11 studies examining the efficacy of the Lee Silverman Voice Treatment (LSVT) BIG program in improving motor function, postural stability, and gait performance among individuals with Parkinson's Disease (PD). The collective findings demonstrate a consistent positive impact of LSVT BIG therapy across a range of outcome measures including the Unified Parkinson's Disease Rating Scale (UPDRS), Timed Up and Go (TUG) test, Functional Gait Assessment (FGA), and postural control assessments.<sup>[11,12,13]</sup>

One of the most notable outcomes across studies was the significant improvement in gait parameters such as stride length, gait velocity, and dynamic balance following LSVT BIG interventions. These improvements are particularly important given that gait disturbances and postural instability are among the most disabling features of PD, often resistant to pharmacologic treatments.<sup>[14]</sup> The intensive and amplitude-focused nature of LSVT BIG likely underpins its success in addressing these motor deficits through principles of neuroplasticity and motor learning.<sup>[12,13]</sup>

Moreover, studies included in the review indicated that LSVT BIG not only improves objective clinical measures but also enhances patient-perceived quality of life and confidence in mobility.<sup>[11,15]</sup> This dual benefit—measurable functional gains and subjective improvements in well-being—highlights the holistic value of the intervention. A number of studies also reported maintenance of benefits over time, suggesting retention of motor learning and sustained improvements, especially when home-based or community follow-up programs were integrated.<sup>[16,17]</sup>

Variations in delivery models (e.g., standard clinic-based vs. telerehabilitation or modified home-based protocols) showed that even modified versions of LSVT BIG could yield clinically significant improvements.<sup>[18]</sup> However, some evidence pointed to the superiority of standard intensive protocols in maximizing motor gains.<sup>[12]</sup> Importantly, a few studies expanded the scope of analysis to include non-motor symptoms, demonstrating that LSVT BIG may also contribute to reducing depression, anxiety, and fatigue in PD patients.<sup>[19]</sup>

Despite the promising outcomes, some limitations should be acknowledged. The heterogeneity in study designs, sample sizes, and outcome measures poses challenges in synthesizing quantitative results. Additionally, the majority of included studies were of short duration, and long-term follow-up data remains limited. There is also a need for larger-scale randomized controlled trials to confirm the generalizability of findings and to better understand the mechanisms underlying observed benefits.

## Conclusion

The evidence reviewed in this systematic analysis supports the effectiveness of LSVT BIG as a therapeutic intervention for improving motor disability, posture, and functional gait in individuals with Parkinson's Disease. The therapy offers a promising, non-pharmacological approach grounded in principles of motor learning and neuroplasticity, enabling patients to make meaningful improvements in movement amplitude, gait dynamics, and balance. In addition to motor function, LSVT BIG also appears to positively influence quality of life and may offer benefits for non-motor symptoms.

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