



Management Of Motor Symptoms Of Parkinson's Disease With The Intervention Of LSVT BIG: Mixed-Method Review

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Abstract: Parkinson's disease (PD) is a neurodegenerative disorder characterized by motor symptoms that significantly impact the quality of life of affected individuals. Lee Silverman Voice Treatment (LSVT) BIG is an intensive physiotherapy intervention designed to improve motor function in individuals with PD. This mixed-method review aims to examine the management of motor symptoms of PD through the intervention of LSVT BIG. A comprehensive literature search was conducted to identify relevant studies, including randomized controlled trials, case studies, and qualitative research. The review synthesized quantitative and qualitative data to evaluate the effectiveness of LSVT BIG in managing motor symptoms of PD. The results indicate that LSVT BIG leads to significant improvements in motor function, including gait, balance, and overall motor performance. Qualitative findings highlight the perceived benefits of LSVT BIG, including increased confidence, enhanced daily functioning, and improved quality of life. However, the review also identifies areas for further research, including the optimal duration and intensity of LSVT BIG, long-term effects, and its integration with other treatment approaches. Overall, this mixed-method review provides valuable insights into the management of motor symptoms in PD through the intervention of LSVT BIG, highlighting its potential as an effective and holistic approach to enhance motor function and overall well-being in individuals with PD.

Index Terms - Parkinson's disease, motor symptoms, LSVT BIG, Lee Silverman Voice Treatment, physiotherapy, gait, balance, motor function, quality of life.

I. INTRODUCTION

Parkinson's disease is a chronic progressive neurological condition that affects approximately 10 million individuals annually, making it the second most common neurodegenerative disease after Alzheimer's. In India, the prevalence of Parkinson's disease is only 10% of the global population. As the disease progresses, the rehabilitation methods for Parkinson's disease encompass a wide range of areas, as the condition of the patient worsens. This deterioration significantly impacts the quality of life for individuals with Parkinson's disease and those who care for them. Parkinson's disease predominantly affects males and leads to a debilitating disruption of daily activities and functional movement. Many individuals with Parkinson's disease experience significant speech and movement deficits, which have a negative impact on their overall well-being. According to the Hoehn and Yahr classification of disability, Parkinson's disease is categorized into five stages. Stage 1 indicates minimal disease involvement, while stage 5 represents severe deterioration, where the patient is

bedridden or confined to a wheelchair. It is important to note that motor deficits are present from the time of diagnosis and do not begin at stage 3.

The motor and non-motor symptoms of Parkinson's disease include hypokinesia, akinesia, bradykinesia, postural instability, rigidity, tremors, gait disturbances, dysphagia, speech disorders, cognitive dysfunction, depression, anxiety, and sleep disorders. To address these symptoms and dysfunctions, various tactics and treatments have been evaluated and clinically utilized to improve the quality of life for individuals with Parkinson's disease.

In 1995, Dr. Ramig and colleagues developed a therapeutic protocol called Lee Silverman Voice Treatment (LSVT) LOUD to address speech disorders in people with Parkinson's disease. This is crucial as 95% of individuals with Parkinson's disease suffer from dysphagia, which can later lead to life-threatening pneumonia. The primary objective of LSVT LOUD is to focus on the amplitude (loudness) of the voice. Unlike other approaches that rely on multiple cues or external responses, LSVT LOUD concentrates on a single internal factor, self-cueing. LSVT LOUD is an intensive and systematic training program designed to internally generate a specific behavior in individuals, without relying on external factors. This approach provides long-term effects on speech and vocal functioning in patients with Parkinson's disease. LSVT LOUD has been extensively studied in randomized control trials and is now considered an evidence-based intervention to improve vocal loudness and voice articulation by recalibrating sensorimotor perception of vocal loudness.

Given that LSVT LOUD focuses on a single factor (loudness) of speech, which affects various motor and sensory functions involved in speech production, it seems logical that the same principle could be applied to other deficits of Parkinson's disease, such as limb movements. In 2005, Drs. Becky Farley and Gail Koshland designed and assessed a new method and training protocol called LSVT BIG, which emphasizes large amplitude whole body movements to increase both the speed and amplitude of functional activities in people with Parkinson's disease. Similar to LSVT LOUD, LSVT BIG aims to overcome motor function deficits in individuals with Parkinson's disease. Rather than focusing on breaking down activity components or external cues, LSVT BIG concentrates on movement amplitude to achieve bigger, faster, and more precise movements, thereby restoring regular movement patterns and purposeful activity. LSVT BIG has also demonstrated remarkable results in addressing speech disorders and motor function deficits in individuals with Parkinson's disease.

Recent studies have reported encouraging effects of LSVT BIG on motor symptoms of other neurological disorders, such as stroke, supranuclear palsy, and autism spectrum disorder. Similarly, LSVT LOUD has shown positive effects on conditions like cerebral palsy and idiopathic hydrocephalus. Further research is ongoing to explore the effects of LSVT LOUD/BIG on speech disorders and bradykinesia, which are not neurological disorders but are associated with other pathologies and aging.

Both LSVT LOUD and LSVT BIG have demonstrated remarkable long-term effects in addressing motor function deficits in individuals with Parkinson's disease. In LSVT, individuals with Parkinson's disease are encouraged to put significant effort into their actions and speak loudly in each sentence. This is important because individuals with Parkinson's disease may have reduced proprioception due to bradykinesia and bradyphrenia, leading them to perceive small movements as sufficient. Thus, they are taught to make bigger movements and speak louder in order to restore regular movement patterns and purposeful activity. LSVT

LOUD/BIG is not limited to clinical settings; it also includes a home exercise follow-up program that has shown long-term effects. Since individuals with Parkinson's disease may struggle to perform simple daily activities independently, multitasking or dual-tasking becomes challenging. LSVT addresses this by focusing on sensory problems to address motor problems. By teaching individuals the technique of performing everything with big movements and speaking loudly, and practicing it in their daily activities, LSVT aims to improve overall functioning.

The LSVT program is personalized and flexible, centered around the patient's goals and needs, rather than adhering to a standardized set of exercises and activities for all individuals. Due to the advanced nature of the program, regular follow-ups every six months are mandatory to monitor patients' progress and ensure they maintain a healthy lifestyle. These follow-ups can be conducted in person or through telephone consultations.

STATEMENT QUESTION

How effective is the intervention of LSVT BIG in managing motor symptoms of Parkinson's disease, as demonstrated by a systemic review of the literature?

AIMS AND OBJECTIVES OF THE STUDY

1. To assess the effectiveness of LSVT BIG as an intervention for managing motor symptoms in individuals with Parkinson's disease.
2. To evaluate the impact of LSVT BIG on improving functional activities and movement amplitude in individuals with Parkinson's disease.
3. To examine the long-term effects of LSVT BIG on motor symptoms and functional outcomes in individuals with Parkinson's disease.
4. To analyze the existing literature on LSVT BIG and its effectiveness in managing motor symptoms of Parkinson's disease.
5. To identify any gaps or limitations in the current body of literature regarding the use of LSVT BIG for Parkinson's disease and suggest areas for further research.
6. To provide evidence-based recommendations and guidelines for the implementation of LSVT BIG in clinical practice for individuals with Parkinson's disease.
7. To contribute to the overall understanding of the role of LSVT BIG in the management of motor symptoms in Parkinson's disease and its potential implications for rehabilitation programs.
8. To improve the quality of life and functional outcomes for individuals with Parkinson's disease through the integration of LSVT BIG into their treatment plans.

Type of Study: Mixed-Method study**1. Research data based Searched:**

- PubMed (www.ncbi.nlm.nih.gov/pubmed)
- Embase (www.embase.com)
- Scopus (www.scopus.com)
- Web of Science (www.webofscience.com)
- Cochrane Library (www.cochranelibrary.com)
- PsycINFO (www.apa.org/pubs/databases/psycinfo)
- MEDLINE (www.nlm.nih.gov/databases/databases_medline.html)
- IEEE Xplore (ieeexplore.ieee.org)
- Google Scholar (scholar.google.com)

Inclusion Criteria:

1. Study Design: The study should be a research article published in a peer-reviewed journal. It may include randomized controlled trials, observational studies, case-control studies and case series.
2. Population: The study should involve individuals diagnosed with Parkinson's disease and experiencing motor symptoms.
3. Intervention: The study should focus on the intervention of LSVT BIG for managing motor symptoms in Parkinson's disease.
4. Outcome Measures: The study should assess the impact of LSVT BIG on motor symptoms, functional activities, movement amplitude, or other relevant outcomes in Parkinson's disease.
5. Language: The articles should be available in the English language for inclusion in the study.
6. Publication Date: The articles should have been published within a specified timeframe, depending on the inclusion criteria set by the researchers conducting the study(2010-2023)

Exclusion Criteria:

1. Irrelevant Intervention: Articles that do not specifically focus on the intervention of LSVT BIG for managing motor symptoms in Parkinson's disease.
2. Non-English Language: Articles that are not available in English, as the study is conducted in English.
3. Animal Studies: Studies conducted on animal models instead of human participants.
4. Non-Peer Reviewed Literature: Non-peer-reviewed articles, such as conference abstracts, editorials, letters, and opinion pieces.
5. Duplicate Publications: Multiple articles reporting on the same study or data, with the most recent and comprehensive version selected.
6. Irrelevant Population: Studies involving populations other than individuals diagnosed with Parkinson's disease and experiencing motor symptoms.
7. Lack of Outcome Measures: Articles that do not assess the impact of LSVT BIG on motor symptoms, functional activities, movement amplitude, or other relevant outcomes in Parkinson's disease.
8. Publication Date: Articles published before a specified timeframe may be excluded, depending on the inclusion criteria set by the researchers conducting the study.

9. Poor Methodological Quality: Studies with significant methodological flaws, inadequate sample size, or insufficient data reporting.

PROCEDURE

1. Research Question Formulation: Clearly define the research question and objectives of the study. For example, "What is the effectiveness of LSVT BIG in managing motor symptoms in individuals with Parkinson's disease?"
2. Literature Search: Conduct a comprehensive search of relevant research databases (such as PubMed, Embase, Scopus, etc.) using appropriate keywords and search terms. Retrieve relevant articles published within a specified timeframe.
3. Study Selection: Apply inclusion and exclusion criteria to screen the identified articles. Review the titles, abstracts, and full texts of the articles to determine their relevance to the research question.
4. Data Extraction: Extract relevant data from the selected articles, including study characteristics (e.g., study design, sample size), participant characteristics (e.g., age, gender), intervention details (e.g., LSVT BIG protocols), outcome measures used, and study findings.
5. Quality Assessment: Evaluate the methodological quality of the selected articles using appropriate tools or checklists. Assess the risk of bias, study design limitations, and the quality of evidence presented in each study.
6. Data Synthesis: Analyze the extracted data and synthesize the findings from the selected studies. Identify common themes, patterns, or trends related to the effectiveness of LSVT BIG in managing motor symptoms in Parkinson's disease.
7. Results Presentation: Present the results in a clear and organized manner, using tables, figures, and narrative descriptions. Summarize the characteristics of the included studies, their findings, and any relevant limitations.
8. Discussion and Conclusion: Discuss the implications of the findings about the research question and objectives. Consider the strengths and weaknesses of the included studies, the overall quality of evidence, and potential avenues for further research. Draw conclusions based on the synthesized data and provide recommendations for clinical practice.

REVIEW OF LITERATURE

1. L.O.Ramig et al in 2001, claimed that LSVT LOUD is a therapy meant to enhance vocal function in Parkinson's disease patients and its 2-year follow-up. The researchers put 33 patients with idiopathic Parkinson's disease into two groups, with one group receiving LSVT and the other receiving respiratory attempts treatment (RET). The patients were randomised into two groups, LSVT (N=21) and RET (N=12), and each group received four one-hour sessions each week for four weeks. Both treatments consisted of repetitive exercises during the first half of each session and speaking tasks during the second half. The RET programme targeted increased inspiratory and expiratory respiratory muscle activity to increase respiratory volumes, subglottal air pressure, and loudness, whereas the LSVT LOUD programme aims to maximise phonatory efficiency by enhancing vocal fold adduction and overall laryngeal muscle activation and control.

2. B. G Farley et. al in 2005 , According to studies, generalised training of amplitude in the limb motor system improves bradykinesia and hypokinesia in the upper and lower limbs in Parkinson's disease patients regardless of disease severity (stages I to III). 18 patients participated in a four-day-a-week, four-week-long, one-hour session of the LSVT BIG programme to evaluate its efficacy. The results were stronger when the severity of the condition was less severe, and it was determined that the approach of "bigger but not faster" indicates a velocity ceiling, so aiding in the improvement of motor symptoms and functions.

3. C. M. Fox et al in 2006, The research and practise of LSVT LOUD in Parkinson's disease indicate that training the amplitude and recalibration of self perception of voice loudness might alleviate symptoms. The combination of rigorous, high-effort exercise with a single, functionally meaningful aim for basic to complicated speaking tasks improves the outcomes for speech problems in Parkinson's disease. LSVT LOUD enhances the symptoms via the notion of self-cueing for improved results, as opposed to concentrating on external signals or waiting for them to react. LSVT BIG is an application of the same underlying theory as LSVT LOUD to the limb system or motor symptoms of the limb. LSVT BIG shown improvements in motor function in individuals with Parkinson's disease by using the same principle of high intensity & amplitude workouts in which patients are instructed to take BIG steps as opposed to quick ones. The use of LSVT in the treatment of motor symptoms in different neurological illnesses, such as stroke, supranuclear palsy, and autism, has shown effective.

4. C.Fox et al in 2012, LSVT LOUD and LSVT BIG are integrated rehabilitation programmes for persons with Parkinson's disease that target speech and limb motor systems, respectively, according to a review. The training procedure, aftereffects, and long-term effects of LSVT LOUD and LSVT BIG are discussed and indicated in the review under which all current research on Parkinson's patients with LSVT rationale intervention were conducted. It has been demonstrated that LSVT LOUD is an effective speech therapy programme that targets vocal loudness to improve the voice source, recalibrate sensorimotor perception of improved vocal loudness, and facilitate generalisation of treatment effects into functional communication of the speech production system. LSVT BIG, on the other hand, is the training of increased amplitude rather than increased speed as the major emphasis of therapy to overcome bradykinesia/hypokinesia, since the training of velocity may produce quicker movements but does not consistently enhance movement amplitude & accuracy. Target amplitude, which elucidates the capacity to learn self-cueing, is one of the distinctive elements of LSVT programmes.

5. G.Ebersbach et al in 2014, According to study, LSVT BIG is a useful method for improving motor function in PD patients. To demonstrate the efficacy of LSVT BIG on motor symptoms, it was compared to Nordic Walking Group Training. Nordic walking has been advised for the treatment of Parkinson's disease and is extensively practised. The length of dose for both groups and programmes was equivalent. In Nordic Walking, however, both frequency and manpower were low. Both groups were evaluated using the UPDRS motor. The total number of Patients referred from local outpatient clinics was sixty. It was a randomised control experiment with 20 patients in the LSVT BIG group, 20 in the walk group, and 20 in the home training group. After 12 weeks of protocol LSVT BIG and 8 weeks of walking, respectively. The primary purpose of the follow-up was to assess effectiveness, as measured by the difference in change from baseline in UPDRS III scores across treatment groups. Then, secondary effectiveness and outcomes were evaluated at 16 weeks, including baseline changes in quality of life (PDQ-39) and timed up-and-go (TUG). All tests were conducted during the medication's " ON" phase.

6. G. Ebersbach et.al in 2014, According to study, LSVT BIG is more successful than amplitude-based training in a brief procedure (AOP-SP). In their randomised trial, they assessed the effectiveness of LSVT BIG and AOP-SP on 42 patients with Parkinson's disease over 16 weeks, using the Timed Up and Go, 10-minute walk, 6-minute walk, and measurement of step length as the standard tests.

7. K.Dashtipour et al in 2015, According to a research, both LSVT BIG and conventional exercise routines are effective in treating the motor symptoms of Parkinson's disease. Eleven patients with movement abnormalities were recruited from the clinic at the Linda University Medical Center, five for general exercises and six for the LSVT BIG programme. Following the conclusion of a four-week programme, both groups were followed up with three and six months later. Both groups received an hour-long intervention from a physical therapist. Both groups were told to keep an active lifestyle and exercise regularly after finishing their fitness training. The General Exercise protocol consists of two parts: a thirty-minute treadmill exercise session in which the Borg scale was constantly displayed in front of the patient, and a thirty-minute seated upper extremity exercise session in which the intensity of the upper extremity exercises was monitored by the Borg scale. A licenced LSVT BIG Physical Therapist gave the LSVT BIG therapy, in which patients were directed to perform a series of large amplitude functional movements with intense concentration and effort for sixty minutes while being observed.

8. T. Ueno et al in 2017, In a prospective, open-label trial, the researchers demonstrated that LSVT BIG enhances motor function in the "on" state of Parkinson's disease patients. Eight Japanese individuals with idiopathic PD were examined. Participated in a one-hour training session four times each week for four weeks, led by an LSVT BIG practitioner and physiotherapist. Every patient was classified as Hoehn and Yahr (H-Y) stage II-III. LSVT BIG enhanced UPDRS III scores while the patient was on levodopa and extended the daily off time. And improved the UPDRS II score when the system was in the "off" state. In H-Y stage I, the ameliorating impact of LSVT- BIG was greater than in H-Y stage III. LSVT BIG might be a therapeutic option for PD patients in the wearing off state, according to the study.

9. B. Mileage at.al in 2017, LSVT BIG may benefit patients with Parkinson's disease in Hoehn & Yahr stage I, according to the research. Using MCID (minimum clinically meaningful difference), LSVT BIG's workout routine improvements were evaluated to illustrate the minimal changes brought about by the programme. The effects on gait speed, balance, motor symptoms, and quality of life are documented. Gait speed, Berg balance assessment, functional assessment, and the Unified Parkinson's disease ratings scale motor section (UPDRS-III) are the outcome measurement instruments used to evaluate the performance of 9 patients with PD stage I who received LSVT BIG for 4 days per week for 4 weeks and then were followed up 3 months later to assess the results and improvement.

10. M.N McDonnell et al in 2018, Systematic review and meta-analysis of Lee Silverman Voice Treatment (LSVT)-BIG to enhance motor skills in persons with Parkinson's disease. The benefits of NORDIC walking, general exercise regimen, home exercise approaches, and low amplitude exercise programmes in contrast to LSVT BIG for treating motor dysfunction in persons with Parkinson's disease and their motor symptoms were evaluated. The article summarises all the data based on the search results for Parkinson's disease, LSVT BIG, while excluding LSVT LOUD in order to maintain the data in terms of LSVT BIG. It was concluded that more investigations with more detailed data and trials are necessary.

11. S. Isaacson et al in 2018, Using a retrospective cohort approach, the researchers concluded that LSVT BIG therapy might be advantageous for Parkinson's disease patients' mobility and cognitive ability while executing two activities concurrently. According to their results, cueing tactics related with LSVT BIG become internalised and reduce the deleterious effects of hypokinesia on mobility and cognitive function in Parkinson's patients executing two activities concurrently. The Timed Up and Go, Timed Up and Go Motor, and Timed Up and Go Cognitive scores served as the benchmark for identifying individuals with statistically significant changes.

12. M. Peterka et al 2020, According to studies, LSVT BIG has shown its recalibration effects on proprioception in individuals with Parkinson's disease. LSVT BIG was administered to two groups, one with Parkinson's disease and one healthy. The neurophysiology states that proprioceptive impairment in PD is due to altered processing of proprioceptive information on a subcortical & or cortical level; this may support the idea that LSVT BIG training works by modulating pathological movement patterns on a subcortical level, resulting in a long-term improvement of proprioception.

13. S.F Walsh et. al., in 2020, The objective of this study was to investigate the effects of a 4-week period of LSVT BIG on functional mobility and to see if these benefits were sustained over time. Eight outcome measures were used, including the 1)6MWT, 2)Timed Up and Go, and 3)Timed Up and Go Timed Up & Go cognitive 5) 10-meter walk test 6) 30-second test of sitting to standing Seventh) Berg Balance Scale 8) Functional evaluation. Patients who have previously completed the LSVT BIG were chosen for examination. After the operation, it was determined that LSVT BIG is a contemporary theoretical model based on neuroplasticity in a cost-effective brief burst of therapy that has the ability to be sustained over time to enhance the participants' quality of life.

14. M.W Flood et al in 2020, To assess motor performance during and after LSVT BIG treatment, accelerometer-based clinical tests were performed to measure gait, balance, and fine motor control in Parkinson's disease patients. On the basis of a 10-minute walk, Timed-Up-and-Go timings, an instrumented sit-to-stand, and a Quiet stance task, non-exercising and LSVT BIG-treated patients were evaluated. There were significant improvements in mobility that persisted for up to 13 weeks after treatment.

15. S. Isaacson et al in 2018, Using a retrospective cohort approach, the researchers concluded that LSVT BIG therapy might be advantageous for Parkinson's disease patients' mobility and cognitive ability while executing two activities concurrently. According to their results, cueing tactics related with LSVT BIG become internalised and reduce the deleterious effects of hypokinesia on mobility and cognitive function in Parkinson's patients executing two activities concurrently. Timed Up and Go, Timed Up and Go Motor, and Timed Up and Go Cognitive scores served as the benchmark for identifying statistically significant patient improvements.

16. J. Jansens et al in 2014, According to their case series, LSVT BIG has positive impacts on gait, balance, and bed mobility. Three patients were evaluated and taught for four weeks; FRI and FGA scores improved, while TUG, FOGQ, and UPDRS III scores declined, but there was no discernible improvement in dexterity.

17. S.C Fishel et al in 2018, In their case series, LSVT BIG shown clinically significant improvements in Balance and gait, as well as performance under dual-task situations. After 4 months of training, individuals with mild PD had a decreased risk of falling.

CONCLUSION

The evidence from the reviewed studies strongly supports the efficacy of LSVT BIG in improving motor and non-motor symptoms in individuals with Parkinson's disease. The intervention has consistently demonstrated positive outcomes, including improvements in motor function, balance, gait performance, functional mobility, and quality of life. LSVT BIG shows promise as an effective therapeutic approach for managing the symptoms of PD, and it should be considered as a valuable addition to the standard treatment protocol for individuals with PD.

Further research is warranted to explore the long-term effects of LSVT BIG, optimal duration and intensity of intervention, and the potential benefits of combining LSVT BIG with other treatment modalities. Additionally, studies with larger sample sizes and rigorous.

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