Critically Appraised Topic Template

Title: There is strong evidence supporting the use of the LSVT-BIG standard protocol for reducing motor symptomology in clients with mild to moderate idiopathic Parkinson's Disease; however, alternative exercise therapy may be equally beneficial.

PICO Question:

When compared with alternative exercise therapy for adults with mild to moderate idiopathic Parkinson's disease, is the standard protocol for the LSVT-BIG program more effective at reducing motor symptomology?

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CLINICAL SCENARIO

Condition/Problem

Parkinson's disease is caused by a loss of dopaminergic neurons of the substantia nigra which helps to modulate the thalamus and its connections to the motor cortex. It has also been determined that there are biochemical anomalies in the basal ganglia (Radomski & Trombly Latham, 2008). The cause is unknown, but age, genetic factors, and environmental factors have all been considered.

- Residual problems with Parkinson's disease include dysfunction in both voluntary and involuntary movements such as tremors, rigidity, and bradykinesia. Disturbances in gait and postural reactions also occur such as festination. Facial expressions may also be decreased and there may be emotional disturbances (Pedretti, 2013). Motor and nonmotor symptoms progress and vary depending on if the condition is mild, moderate, or advanced. Nonmotor symptoms of Parkinson's include changes in mood (depression, anxiety & apathy), and deficits in cognitive functioning (difficulty multi-tasking, slowed cognitive speed, memory deficits, dementia). Throughout the entire disease process, postural instability is a concern due to the impact it can have on daily occupational performance.
- As previously detailed by Radomski & Trombly Latham (2008) as well as the Parkinson's Resource Organization (2016), the stages used to classify the stage of Parkinson's are as follows:
  - Stages according to Hoehn and Yahr (1967):

Stage	Brief Description
Stage I	Unilateral symptoms, usually with minimal or not functional impairment.
Stage II	Bilateral or midline involvement, without impairment of balance
Stage III	Postural instability, mild to moderate functional disability.
Stage IV	Fully developed, severely disabling disease; able to walk and stand but markedly incapacitated.
Stage V	Confined to wheelchair or bed.

Incidence/Prevalence

- As reported by the Michael J. Fox Foundation (2016), Parkinson's disease affects one in 100 people over the age of 60 years old. It is estimated that there are at least one million people in the United States, and over five million in the world, who have Parkinson's disease.
- The Parkinson's Disease Foundation (2016) estimated that 60,000 Americans are diagnosed with Parkinson's disease every year, and it should be considered that there are undetected cases as well. This organization cites there being more than 10 million people worldwide who are living with Parkinson's disease. Approximately 4% of people who are diagnosed with Parkinson's disease were

diagnosed before they were 50 years old. Males are 1.5x more likely to have Parkinson's disease than females.

Impact of the Problem on Occupational Performance

- While symptoms of Parkinson's manifest differently in each person, common symptoms include; bradykinesia, tremor, rigidity, postural instability, decline in motor skills, freezing (inability to move). Consequently, those with Parkinson's often experience difficulty in completing basic ADLs, which require balance and gross and fine motor control (e.g., dressing, transferring, feeding, grooming, toileting, etc.). These motor aspects that impair motor control can increase stress or embarrassment of family members when trying to function in the community. Take for instance unsteadiness that results in spilling and dropping food on the lap, shirt, and face of someone with Parkinson's. The family may become apprehensive to go out to eat due to fear and shame of others at the restaurant. Other ambulatory impairments such as the freezing and postural instability can require extra planning and time when engaging in community activities that may be seen as a burden.
- The nonmotor components can strain social and family relationships. Depression can decrease motivation and limit activity.
- As evident by the writing of Pedretti and definitions provided by the American Occupational Therapy Association (2014), deficits in cognitive function are likely to impact performance in IADLS (e.g., financial management, home establishment/maintenance, shopping). Depression affects motivation and is likely to impair participation and persistence in the preceding occupations.

Intervention

- As detailed by Janssens et al. (2014) and Fox et al. (2012), the Lee Silverman Voice Treatment (LSVT) BIG program is an exercise program done on a one-to-one basis that emphasizes high amplitude movements involving the trunk and limbs. The first half of exercises encompass whole body exercises requiring repetitive multidirectional movements in full amplitude. These exercises consist of the two tasks including maximum sustained movements while seated and repetitive and directional movements while standing. The second half of the session consists of functional, goal directed activities of daily living dedicated to the needs and desires of the client. Effort is factored with the hope and expectation that the client is exerting at least 80% effort during all movements as determined by a visual analogue scale.

seated. The overall session outlined by Janssens et al. (2014) appears as follows:

Task	Exercises
Task 1: maximum sustained movements:	Exercise 1: 8 repetitions, sustain big "stretch" floor to ceiling Exercise 2: 8 repetitions, sustain big "stretch" side to side
Task 2: repetitive/ directional movements: standing	Exercise 1:16 repetitions, big step forward (8 repetitions each leg) Exercise 2: 16 repetitions, big step sideways (8 repetitions each side) Exercise 3: 16 repetitions, big step backward (8 repetitions each leg) Exercise 4: 20 repetitions, forward big rock and reach (10 repetitions each side) Exercise 5: 20 repetitions, sideways big rock and reach (10 repetitions each side)
Task 3: functional component movements	Patient identifies 5 movements he or she does in functional everyday living (e.g., sit-to-stand). Clinician and patient select one simple component of each of these movements.

	There are 5 repetitions for each of the component movements: "Do your movement with the same effort/bigness that you do during daily exercises."

- The schedule for the LSVT-BIG program is four consecutive days a week for 4 weeks, which results in 16 sessions in one month. The intensity is standardized with having the days four days of the week being consecutive and task repetitions varying from 8-16, but specified for each movement. Each treatment session lasts 60 minutes. There is no specific method for grading the movements, but "bigger" movements

OT Theoretical Basis

- LSVT-BIG is supported by the neurodevelopmental theory frame of reference (Fox et al., 2012). This frame posits that repetitive experience in particular movement patterns ensures those patterns become more readily accessible for future motor performance and will be applied to future movement tasks (McColl et al., 2015). Hence, LVST-BIG may provide people with Parkinson's repetitive experience in performing high amplitude movements with optimal feedback required to integrate those larger and more controlled movements into occupational participation and daily performance (Janssens et al., 2014).
- LSVT-BIG may serve as a highly repetitive, and intense exercise program that can foster neurological motor changes in people with Parkinson's.

Science Behind the Intervention

- The LSVT-BIG program is believed to have similar effects on movement that the LSVT-LOUD program has found on vocalization. The LSVT-BIG program aims to restore normal movement amplitude by altering the performance that the patient has for performing the movement (Janssens et al., 2014). Research has been documented neural mechanism changes with the LSVT-LOUD program (Fox et al., 2012). These documented changes were found immediately following completion of that program. The creation of the LSVT-BIG program stemmed directly from the success with the LSVT-LOUD program; if the program was that effective for vocal processes, those similar changes are attainable with a movement program for motor performance.
- High amplitude exercises, at least 80% effort, and proper cuing to encourage "BIGness" are components of the program. These minimum requirements in effort and amplitude are important because that is the rationale for what is required to cause the retraining within the musculoskeletal and nervous systems. The LSVT-BIG program is used as a training and neurological re-educational intervention (Fox et al., 2012). The focus of these specific exercises is to alter the motor programming to become accustomed to larger movements using amplitude to overcome bradykinesia and hypokinesia.

Why is this intervention appropriate for OT?

- Although utilized by other clinicians such as physical therapy, the LSVT-BIG program is within the realm of occupational therapy as an intervention to help those with Parkinson's disease try to increase their movement and increase their independence and ability to perform daily occupations. Some occupational therapists currently utilize this program with physical therapy and alternate who leads the sessions. The client-centered focus on functional every day activities as demonstrated in the third task of the program session involves in daily exercises incorporate values and focuses of occupational therapy, and the occupational therapist would not only be adequately able to administer the program when trained, but also offer a unique skillset when considering and analyzing daily performance.
- Overall, the LSVT-BIG program is appropriate for OT to use as a preparatory activity for task orientated activities. If the functional activity the client selected to work on was cooking, then that

task would be broken up into component parts after completing the first two tasks of the program session.

References:

American Occupational Therapy Association. (2014). Occupational therapy practice framework: Domain and process. *American Journal of Occupational Therapy, 68*(Suppl. 1), S1–S48.

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FOCUSED CLINICAL QUESTION: Is the LSVT-BIG program when compared with alternative exercise therapy for average 63-67-year-old adults with mild to moderate idiopathic Parkinson's disease more effective at reducing motor symptomology and ADL performance in regards to the UPDRS III score.

SEARCH SUMMARY:

Five data bases were searched. The total number of relevant articles located was 7. Of those, 3 were Level 1b, 1 was level 3b, 1 was Level 4, and 2 were Level 5. The 3 articles chosen to be critiqued exhibited the greatest rigor and strength. In addition, the populations were similar in age and disease progression, and similar outcome measures were used.

In comparison to the LSVT-LOUD Program, the BIG Program had significantly less literature available on long-term effects, likely due to its more recent creation. However, data base searches elicited a fair number of studies comparing it to other common interventions as well as shorter protocols than the standard. Although more research is necessary, the quality of the studies available was high.

TABLE 1: SEARCH STRATEGY

TABLE 2: SUMMARY OF STUDY DESIGNS OF ARTICLES RETRIEVED

Search Terms	Inclusion and Exclusion Criteria
LSVT-BIG, LSVT, BIG, Parkinson's disease, exercise programs	Inclusion: + High Amplitude Exercise + Effects Exclusion: *due to limited success with finding articles initially no exclusion criteria were used.

Level	Study Design/ Methodology of Articles Retrieved	Total Number Located	Citation (Name, Year)
1a	Systematic Reviews or Metanalysis of Randomized Control Trials	0	
1b	Individualized Randomized Control Trials	3	Dashtipour, K., Johnson, E., Kani, C., Kani, K., Hadi, E., Ghamsary, M., Pezeshkian, S., & Chen, J., (2015). Ebersbach, G., Ebersbach, A., Edler, D., Kaufhold, O., Kusch, M., Kupsch, A., & Wissel, J., (2010). Ebersbach, G., Grust, U., Ebersbach, A., Wegner, B., Gandor, F., & Kühn, A. A., (2014).
2a	Systematic reviews of cohort studies	0	
2b	Individualized cohort studies and low quality RCT's (PEDro ≤4)	0	
3a	Systematic review of case-control studies	0	
3b	Case-control studies and non-randomized controlled trials (quasi experimental or clinical trials)	1	Farley, B. G., & Koshland, G. F., (2005).
4	Case-series and poor quality cohort and case-control studies	1	Janssens, J., Malfroid, K., Nyffeler, T., Bohlhalter, S., & Vanderbellingen, T., (2014).

5	Expert Opinion	2	Farley, B. G., Fox, C. M., Ramig, L. O., & McFarland, D. H., (2008). Fox, C., Eberbsbach, G., Ramig, L., & Sapir, S., (2012).

TABLE 3: STUDIES INCLUDED

	Study 1 (Berlin)	Study 2 (BIG & Short)	Study 3 (Motor & Nonmotor)
Design	RCT	RCT	RCT
Level of Evidence	1b	1b	1b
Rigor Score	9/11	7/11	10/11
Population	58 adults with PD, Hoehn & Yahr stage I-III	34 adults with PD, Hoehn & Yahr stage I-III	11 adults with early to mid-stage PD
Intervention Investigated	Standard protocol of LSVT-BIG	Standard protocol of LSVT-BIG	Standard protocol of LSVT-BIG
Comparison Intervention	<u>Domestic exercise (HOME)</u> • 1-hour instruction of domestic training with practical demonstration and training. • Exercises included stretching, high-amplitude movements, as well as active workouts for muscular power and posture. • Participants were encouraged to exercise regularly at home. <u>Nordic walking (WALK)</u> • 16 sessions (2x/wk. for 8 wks.) lasting 1 hr and consisting of standardized protocol for beginners including warm-up, practice, and cool-down.	<u>Short protocol of LSVT-BIG</u> • 10 x 1 hr sessions (5x/wk. for 2 wks.) of LSVT-BIG exercises. • All other factors similar to that of the typical program protocol.	<u>General exercise program</u> • Two parts: treadmill exercises and seated upper extremity (UE) exercises, all performed in a group setting. • A 30-minute treadmill exercise session and a seated upper extremity exercise session. • For the treadmill, 30 minutes of walking with no inclination and speed was increased until exertion was 5/10 and 75% of heart rate maximum with blood pressure less than 200/110 mmHg. Below 180/110 mmHg required to begin the next portion. • During the seated UE exercises, 30 minutes of a variety of exercises were performed. Protocol included: theraband

	• Performed in a local park in groups of 4 to 6 and constantly supervised by the therapist.		arm swings for 4 minutes (high intensity, Borg 4-5), trunk side flexion for 2 minutes (medium intensity, Borg 3-4), marching in place for 2 minutes (medium intensity, Borg 3-4), buttoning/unbuttoning for 2 minutes (low intensity, Borg 2-3), theraband rowing for 4 minutes (high intensity, Borg 4-5), trunk rotations with reaching for 2 minutes (medium intensity, Borg 3-4), cone stacking for 2 minutes (medium intensity, Borg 3-4), finger tapping for 2 minutes (low intensity, Borg 2-3), theraband trunk rotation for 4 minutes(high intensity,Borg4-5), marching in place with arm swings for 2 minutes (high intensity, Borg 4-5), seated arm swings for 2 minutes(medium intensity, Borg 3-4), and finger to nose for 2 minutes(low intensity, Borg 2-3)
Dependent Variables	Primary: Motor symptomology Secondary: Affect of PD on functioning Mobility Speed of walking	Primary: Motor symptomology Secondary: Impression of change Affect of PD on functioning Mobility Speed of walking	Primary: Motor symptomology Secondary: Depression Anxiety Fatigue

		Step length Arm mobility	
Outcome Measures	Primary: UPDRS-III Secondary: PDQ-39 TUG 10m walk test	Primary: UPDRS-III Secondary: CGI-C PDQ-39 TUG 10m walk test 6-minute walk accelerometer Box and block test	Primary: UPDRS-III Secondary: BDI BAI MFIS
Results	UPDRS-3 (b/t group) LVST-BIG vs. Walk: p<0.001 LVST-BIG vs. HOME: p<0.001	UPDRS-3 (w/n group) LVST-BIG: p <0.001 AOT-SP: p <0.001	UPDRS-3 (b/t group) LVST-BIG vs. Exercise: p=0.503
Effect Size	LVST-BIG vs. Walk: d=2.34 LVST-BIG vs. HOME: d=2.16	LVST-BIG: d=3.48 AOT-SP: d=2.45	LVST-BIG vs. Exercise: d=1.29
Conclusion	LSVT-BIG was superior to HOME and WALK in reducing motor symptomology, and in improving scores in the TUG, and the 10m walk test. QOL was not significantly improved in any of the interventions.	Both programs showed positive effects in reducing motor symptomology. The standard protocol more greatly improved patient-perceived benefit.	Both programs showed positive effects. General exercise may be as beneficial as LSVT-BIG.

SYNTHESIS SECTION:

PICO Question:
When compared with alternative exercise therapy for adults with mild to moderate idiopathic Parkinson's disease, is the standard protocol for the LSVT-BIG program more effective at reducing motor symptomology?

Overall Conclusions:
Terms
The LSVT-BIG program refers to the outlined protocol of three groups of tasks that are expected to be completed with 80% of effort, and at four continuous sessions done for four weeks, totalling 16 sessions within one month, with the number of repetitions for each task being standardized.
Alternative exercise therapy is a broad term that encompasses any activity regime done on a type of schedule or routine.
Mild to moderate Parkinson's disease is referencing stages I-III outlined by Hoehn and Yahn (Radomski & Trombly, 2014).
Motor symptomology refers to voluntary and involuntary motor characteristics associated with Parkinson's disease as evaluated by the change in UPDRS III score from baseline.

Findings

One article measured the within group effects of both the standard protocol of the LSVT-BIG program as well as a short protocol. Both protocols elicited statistically significant reductions in motor symptomology with very large effect sizes. Two articles compared the LVST-BIG standard protocol to other interventions and found LSVT-BIG to be statistically superior to Nordic walking & HOME exercise program, with very large effect sizes, in reducing motor symptomology. Statistically significant reduction in motor symptomology was found in both the LVST-BIG standard protocol and a general two-part exercise protocol at 6-month follow-up, however, there was no statistical significant difference in reducing motor symptomology when LVST-BIG standard protocol was compared to the general two-part exercise protocol. The general exercise and Nordic walking were conducted in group therapy sessions with the standard protocol of the LSVT-BIG program, HOME program, and the short protocol of the LSVT-BIG program administered on a one-to-one basis.

Boundaries:

There were a total of 103 patients who participated in these three studies. All had a diagnosis of mild to moderate stage idiopathic Parkinson's Disease. Adults were included if their medication had been stable for a minimum of 4 weeks prior to the study and if they were able to attend outpatient treatment. Patients were excluded if they had atypical Parkinson's Disease, dementia, severe depression, disabling dyskinesia or a co-morbidity affecting mobility or ability to exercise. Average age ranged from 63.4 to 67.3 years across the three studies with an overall age range of 30 to 90 years.

Implications for Practice:

Results suggest that both the standard and short protocols of the LSVT-BIG program are effective in reducing motor symptomology in adults with mild to moderate Parkinson's Disease; however, the standard protocol elicited greater patient-perceived benefit. In addition, these protocols may not be more effective than a general exercise program.

What is not yet known is the long term impact of this program on motor symptomology beyond 6 months. In addition, brain scans have not been done for the BIG program to document neural changes as they have in the LSVT-LOUD program (Fox et al., 2012). This program has also not been studied in individuals with severe stages of Parkinson's Disease. Lastly, studies have not been done to determine how these changes translate into improved occupational performance.

CLINICAL BOTTOM LINE:

There is strong evidence supporting the use of the LSVT-BIG standard protocol for reducing motor symptomology in clients with mild to moderate idiopathic Parkinson's Disease; however, alternative exercise therapy may be equally beneficial.

Limitation of this CAT: This critically appraised paper (or topic) has been reviewed by occupational therapy graduate students and the course instructor.

REFERENCES

Critiqued Articles:

Dashtipour, K., Johnson, E., Kani, C., Kani, K., Hadi, E., Ghamsary, M., … & Chen, J. (2015). Effect of exercise on motor and nonmotor symptoms of parkinson's disease. *Parkinson's Disease, 2015,* 1-5.

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Ebersbach, G., Grust, U., Ebersbach, A., Wegner, B., Gandor, F., & Kühn, A. (2014). Ampitude-oriented exercise in parkinson's disease: A randomized study comparing LSVT-BIG and a short training protocol. *Journal of Neural Transmission, 122*(2), 253-256.

Related Articles (Not Individually Appraised)

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Other Related Information

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