The Impact of Group Format Therapy on Voice in Parkinson's Disease: A Pilot Project

L'impact de la thérapie de groupe sur la voix dans la maladie de Parkinson : un projet pilote

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KEY WORDS

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Abstract

At present, the most effective evidenced-based program of voice treatment in Parkinson's Disease (PD) is the Lee Silverman Voice Treatment (LSVT), an intensive 4-week program delivered on an individual basis. This individual format limits both access to and the ability to offer LSVT. Recently, research in the field of voice treatment in PD has begun to investigate alternative delivery formats such as group therapy. The pilot project described here provided an intensive group format voice treatment protocol to nine adults with idiopathic PD in Santiago, Chile. The project's goal was to offer quality voice therapy to as many participants as possible without compromising effectiveness of treatment, while creating an opportunity for cross-cultural sharing of knowledge between Chilean and Canadian speech-language pathology (S-LP) colleagues. The group treatment protocol is outlined in detail and brief statistical analyses of vocal loudness changes immediately post-treatment and at 3-4 months follow-up are provided. The results presented suggest that group format therapy may be an effective method of providing vocal therapy for some patients with PD. Although the project presented was not a research study and therefore results must be interpreted with caution, the improvements observed warrant further investigation in more controlled environments. Given the challenges of access to quality public health care in Chile and the large caseloads of Canadian S-LPs, the project results described may have relevance for treatment delivery in Canada.

Abrégé

Actuellement, le programme de rééducation vocale le plus efficace et le mieux supporté par la littérature pour la maladie de Parkinson est le Lee Silvermann Voice Treatment (LSVT), un programme intensif de quatre semaines offert de façon individuelle. Cette modalité individuelle limite à la fois l'accès au service et la capacité à l'offrir. Récemment, la recherche effectuée au niveau de la rééducation vocale chez des individus atteints de la maladie de Parkinson a commencé à explorer des modalités alternatives de prestation de services, tels que la thérapie de groupe. Dans le présent projet pilote, un protocole de rééducation vocale, offert sous la modalité de groupe, a été offert à neuf adultes atteints la maladie de Parkinson idiopathique à Santiago (Chili). Le but du projet était d'offrir une rééducation vocale de qualité au plus grand nombre possible de participants sans compromettre l'efficacité du programme de rééducation, tout en créant une occasion interculturelle d'échanges de connaissances entre collègues orthophonistes chiliens et canadiens. Le protocole de la thérapie de groupe est décrit en détail et de brèves analyses statistiques effectuées au niveau du changement du volume de la voix observé immédiatement après la rééducation vocale, ainsi qu'après un suivi de 3-4 mois, sont fournies. Les résultats présentés suggèrent que la modalité de groupe peut être une façon efficace d'offrir une rééducation vocale à certains patients atteints de la maladie de Parkinson. Même si le projet présenté n'était pas une étude de recherche et, donc, les résultats doivent être interprétés avec prudence, les améliorations observées justifient d'autres recherches dans des environnements plus contrôlés. Étant donné les difficultés d'accès à des soins de santé publics de qualité au Chili et les lourdes charges de travail des orthophonistes canadiens, les résultats du projet décrit pourraient s'avérer pertinents dans la prestation de services au Canada.

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1.0 Background:

It is estimated that 70-90% of people with Parkinson's disease (PD) experience some change in their speech and voice or are dissatisfied with how they communicate (Halpern et al. 2012; Majdinasab, Karkherian, Moradi, Ali Shahidi, & Salehi, 2012; Miller, Deane, Jones, Noble & Gibb, 2011; Trail, Fox, Ramig, Sapir, Howard & Lai 2005). These changes most frequently result in a hypokinetic dysarthria, characterized by monoloudness, a monotone voice, and imprecise articulation (Fox, Ebersback, Ramig & Sapir 2012; Kwan & Whitehill, 2011; Skodda, Grönheitet, Mancinelli & Schlegel, 2013). Impaired speech, voice, and communication are reported to have a significant, negative impact on ratings of communicative participation and quality of life for the PD population (Baylor, Burns, Eadie, Britton & Yorkston, 2011; Chenausky, MacAsulan & Goldhor, 2011; Majdinasab et al., 2012; Sackley et al, 2014; Schrag, Jahanshahi & Quinn, 2000). Despite this, less than 30% of these people receive speech treatment (Miller, et al., 2011; Simberg, Rae, Kallvik, Salo, Martikainen 2012; Trail et al, 2005). Physical immobility, and geographical constraints as well as under-staffing, large caseloads, and under referral to speech-language pathology (S-LP) all contribute to this under serving of those living with PD (Constantinescu et. al, 2010; Fox et. al, 2012; Miller et. al 2011).

The most effective, evidence-based program in speech and voice treatment for PD is Lee Silverman Voice Treatment (LSVT), a therapy program in which one of the key components is high frequency, high intensity, individual treatment (Mollaei, Shiller & Gracco, 2013; Ramig, Countryman, Thompson & Horii, 1995; Sackely et al 2014; Sapir, Spielman, Ramig, Story & Fox, 2007; Varanese, Birnbaum, Rossi & Di Rocco, 2010; Whitehill, Kwan, Lee & Chow, 2011; Whitehill & Wong, 2007). In LSVT, clinicians see a client 4 times per week for 1 hour over a 4-week period, totalling a minimum of 16 hours of direct-client contact. To offer therapy using the name LSVT, a clinician must be LSVT certified and must provide the protocol exactly as outlined above (Fox, Morrison, Ramig, Sapir, 2002). In Canada's public health care system it is difficult, if not impossible, to dedicate so much time to a single client. According to the background document of the Steering Committee of the Inter-Professional Caseload Management Planning Tool in Occupational Therapy, Physiotherapy and Speech-Language Pathology in Canada (2009), speech-language pathologists (S-LPs) working with adults already report caseloads more than twice the recommended size. Furthermore, the Steering Committee notes unmanageable caseloads are a source of job dissatisfaction for S-LPs, as they feel they cannot deliver quality service to their clients. These challenges are not unique to Canada – a study of S-LP service delivery in PD in the United Kingdom revealed that clinicians provided an average of 4.5 hours of service per client over an average of 6 weeks (Miller et al., 2011), compared with LSVT's 16+ hours in 4 weeks. Considering limited resources and heavy caseload demands as well as patient challenges with travel and access to treatment, it is becoming increasingly recognized that the LSVT schedule and method may limit the number of S-LPs providing, and how many persons with PD receive, LSVT (Searl, Wilson, Haring, Dietsch, Lyons & Pahwa 2011; Skodda, Grönheit, Mancinelli & Schlegel, 2013; Spielman, Ramig, Mahler, Halpern, & Gavin, 2007).

1.1 Alternative forms of intensive voice treatment

In an attempt to diversify methods of voice therapy in PD, recent investigations have examined the efficacy of alternative forms of LSVT. Extended versions of LSVT on various schedules have demonstrated improved vocal sound pressure level immediately post-treatment (Spielman et al, 2007). Extended versions of LSVT may be a viable alternative in some circumstances, however they continue to present problems for an overburdened health care system, as extended formats still require a dedication of time from clinicians and patients which can limit access to programming.

In an attempt to reduce time and travel demands for patients, use of telehealth forms of LSVT have also been investigated (Constantinescu et al., 2010; Constantinescu et al., 2011; Halpern et al., 2012; Howell, Tripoliti & Pring, 2009). Initial results of these protocols are promising, demonstrating significant gains pre- to post- treatment as well as pre-treatment to 6-month follow-up. The use of technology removes several barriers to treatment such as mobility and geographical constraints (Halpern et al., 2012), however caseload issues would likely not be improved by this method, as telehealth treatment protocols continue to require an individual, high intensity, and high frequency therapy format.

In their 2011 study, Searl et. al provide a summary of group format therapy investigations which have been completed to date. De Angelis and colleagues, Robertson and Thomson and Sullivan, Brune and Beukelman (as cited in Searl et al., 2011) have all investigated group format therapy alternatives, though to the best of this author's knowledge, only Searl et al. have tried to closely mimic the LSVT protocol. Searl et al's results demonstrated improved vocal loudness immediately post-treatment though the lack of long-term follow-up to evaluate retention of gains was

noted as a limitation of their study (2011). Detailed discussion of their treatment protocol is offered later in this report.

1.2 The health care system in Chile

The pilot program presented here was delivered in Santiago, Chile. Chile's health care system is a two tiered one, in which public health insurance covers 69% of the population, private insurance plans support 17% of citizens, and the remaining 14% either receive assistance through other public agencies (such as Military Health Services) or live without health coverage (Vargas & Poblete, 2008). In the early 2000s, the country introduced health reforms aimed at improving the inequalities in this system. The reforms identified 56 conditions, including PD, which would receive a guaranteed basic, uniform benefit plan, with fast-track access to care. The supports created by these reforms are criticized as being "obviously insufficient" for the needs of those living with PD (Sáez, 2008, p 254), as access to medications remains limited and only a single neurological review per year is covered. Therapeutic services such as S-LP or physiotherapy are not included at all (Saez, 2008; Homedes & Ugalde, 2005).

In an attempt to fill the gap in services offered by current health care programs, and to improve the quality of life for those living with PD, the Liga Chilena Contra El Mal De Parkinson (2008) (hereafter referred to as the Liga) offers access to medications, consultations with neurologists and psychologists, and therapeutic support from physiotherapists, occupational therapists, and one speech-language pathologist. Members pay a minimal yearly fee to access these services, while fundraising and individual donations cover the majority of program costs (www.parkinson.cl). At the time of publication, although the LSVT method is known by name in Chile, only four speech-language therapists (SLT) in the country are LSVT certified (http://www.lsvtglobal.com/clinicians). The full-time SLT at the Liga is not an LSVT certified clinician.

1.3 Pilot Project Background & Purpose of Brief Report

The project described was the result of a partnership between a Canadian, LSVT-trained S-LP living in Chile and the coordinators of the Liga, who were looking for new and novel ways to provide therapeutic services to their members. Funding for this pilot program was obtained through a national program of sponsorship from Chile's Servicio Nacional de la Discapacidad (SENADIS). The goals of this project were two-fold: 1) to provide intensive, high effort voice therapy to as many patients as possible without compromising the integrity of therapy and 2) to promote cross-cultural sharing of therapeutic knowledge between Chilean and Canadian S-LP colleagues. Given the challenges of access to quality public health care in Chile described previously and challenges with access and provision of services in Canada, results described here may be of relevance for S-LP service provision within Canada's health care system.

This report will describe the group therapy protocol that was used, as well as offer analyses of treatment results that may add to the body of information on group therapy in Parkinson's disease. A 3-4 month longitudinal review is included in this report as an early indicator of the potential for long-term maintenance of skills acquired in a group environment. The report presents an evaluation of the feasibility of group therapy for people with PD; as it was a clinical project and not an experimentally controlled study the results outlined here are intended to neither confirm nor refute the productivity of group therapy in PD disease, nor to suggest that this method is better or worse than an individual approach to treatment. Rather the intention is to examine whether group voice therapy may be promising as a treatment option for people with PD. Further investigation in the field of group therapy in PD are necessary to fully ascertain the efficacy of this method of treatment.

2.0 Methods

2.1 Participants

Ten adults with idiopathic PD were selected to participate in this project. Participants were selected according to four criteria: 1) membership in the Liga 2) possession of a 'carta de descapacidad' (disability card), a requirement of the funding grant given by SENADIS 3) no more than mild cognitive changes identified by the Liga SLT, based on her observation and evaluation of participants during prior therapies. No formal cognitive evaluations were completed to corroborate the SLT's subjective descriptions 4) A caregiver willing to bring them to and from therapy sessions. Individual participant information is summarized in Table 1.

In keeping with the ethical requirements and clinical treatment procedures of the Liga, all participants were given an explanation of the group protocol and each provided their informed consent to participate prior to enrolment in the project, as well as signing a written consent for release of information in order to have their results included in this article. Thanks to the funding obtained by SENADIS, participation in this pilot project was free for all participants.

Participants were divided into two groups (group A & B) of 5; gender was evenly distributed so that one group

consisted of 3 men and 2 women, the other of 2 men and 3 women. Attempts were made to evenly divide the groups based on degree of vocal and cognitive impairment, so that each group had one nearly aphonic patient, one minimally vocally impaired participant, and one participant with mild cognitive challenges. A brief neurological and medical verbal history, taken from each participant before the start of treatment, revealed a relatively healthy group, with the exception of one participant who became critically ill and could not complete the program. Medical issues reported included: osteoarthritis, osteoporosis, diabetes, hypertension, myoma, hysterectomy, hernia, reflux, and back pain. To the best of this author's knowledge, none of these medical issues contribute to a hypokinetic dysarthria. As one participant was unable to complete the program due to medical complications, all descriptions below and all statistical analyses include 9 participants and not the original 10 selected for the project.

2.2 Aspects of the voice group

In an attempt to mimic LSVT as closely as possible session structure, amount and type of instruction, treatment focus, therapy activities, subjective therapist feedback, homework, and total hours of treatment in this group protocol were all designed in a manner comparable to those of LSVT. Differences between the group format and the standard LSVT method included increased duration and reduced frequency of sessions, absence of daily instrumental feedback, and limited individualization of activities during sessions. All aspects of the protocol are described in detail below. It should be noted that all participants were clearly

Table 1. Participant demographics.

Group	Subject	Gender	Age	Time Since Diagnosis (years)	Cognitive Changes Noted? S = Self noted O = S-LP noted N= None noted by self or S-LP
A	1	F	67	6	N
	2	F	69	28	N
	3	M	71	15	S, O
	4	M	68	29	N
	5	M	69	12	N
B	6	F	75	12	N
	7	M	72	13	N
	8	F	67	4	S, O
	9	F	77	2	S
	10	M	76	28	S, O
Summary		M =5 F = 5	Mean = 70.5	Mean = 13.1	N = 6 S = 4 O = 3

informed that they were not receiving LSVT but were part of a pilot group voice therapy protocol.

2.2.1 Language & Instruction

All of the sessions were in Chilean dialect Spanish. The LSVT-trained clinician (Canadian), who is conversationally fluent in Spanish, led all sessions for the first group of participants while the Chilean Liga speech-language therapist (SLT) observed sessions, offered translation and language support in instances where instructions may not have been clear, and provided assistance during individual activities (described below). As one of the goals of this project was to promote cross-cultural learning and information sharing, the second group received instruction from a combination of the Liga SLT and the Canadian S-LP. Chilean SLTs, including the Liga SLT, study for 5 years to receive a Bachelors in Fonoaudiología (Speech Therapy). The Liga SLT additionally holds a 1 year Diploma in Adult Neuropsychology and Neuropsychiatry.

Two Chilean SLT students, who were completing their practicum with the Liga as part of the requirements for graduation from the Bachelor of Speech Therapy program, were also in attendance throughout this project. These students had the opportunity to observe and occasionally support individual practice during group sessions, with the mentorship and guidance of the Canadian S-LP and her Chilean SLT colleague.

2.2.2 Timeline and treatment hours

Three 1.5-hour group sessions were given per week for four weeks. When compared with the LSVT method, which provides four 1-hour sessions per week for 4 weeks (240 minutes/week x 4 weeks = 960 therapy minutes), the group program presented here provided slightly more therapy minutes (270 minutes/week x 4 weeks = 1080 minutes). All sessions were mandatory and it was emphasized at pre-treatment evaluation and in all sessions that participation and attendance were essential if participants hoped to achieve any change in vocal production. Despite this emphasis, a few participants were unable to make one or more sessions due to health or caregiver issues (i.e. unable to be driven to/from the Liga for sessions). See Table 2 for a summary of attendance.

2.2.3 Session Outline

All sessions began with a review of loud voice principles: the importance of thinking loud and the difference between a 'loud' and a 'shout' voice were explained, and participants were instructed to use the effort of a loud voice whenever they spoke. This educational portion was followed by warm-ups and hierarchical tasks, as in LSVT. In each session, attempts were made to mimic LSVT in ratio of time per task as closely as possible (Table 3).

Table 2. Summary of attendance. Subject #10 became critically ill at the midpoint of therapy and was unable to complete the program.

Subject	Sessions Attended	% Attendance
1	12/12	100%
2	12/12	100%
3	12/12	100%
4	12/12	100%
5	12/12	100%
6	10/12	83%
7	12/12	100%
8	11/12	92%
9	12/12	100%
10	Did not complete therapy	
Total sessions attended	105/108	
Total % Attendance		97%

Warm-ups

A vocal 'warm-up' phase that attempted to closely approximate the LSVT program's 'daily tasks' was completed at the start of each session. Warm-ups consisted of three parts, designed to exercise the vocal folds and calibrate participants' loudness through cues, modelling, and feedback from clinicians and other group members. Supports and feedback for all tasks were gradually reduced within and across sessions so that in the final session minimal or no cues were being provided as participants learned to self-calibrate and regulate their own vocal loudness.

Table 3. Comparison of LSVT and group treatment protocol sessions in minutes per task. Although overall time in each task is comparable, in the LSVT protocol all minutes are dedicated to a single individual, while in the group protocol these minutes are divided amongst 5 individuals, therefore minutes per individual are reduced compared with the LSVT protocol.

Task	LSVT protocol	Group protocol
Total Session Duration	50 – 60 minutes	80 – 90 minutes
Warm ups	30	30 – 45
Sustained phonation	12 – 15	10 – 15
Fundamental Frequency ("highs and lows")	10 – 12	10 – 15
Functional Phrases	5 – 10	10 – 15
Hierarchy of Practice Tasks	30	40 – 50
Reading	20+	15 – 20
Conversation Tasks	5 – 10	20 – 25
Homework Assignment	5	5 - 10

Firstly, a sustained phonation task was completed. Each participant initially heard and watched the S-LP model a sustained 'ah', after which they imitated this production individually. Cueing (i.e. "keep going, louder!"), modelling and shaping (i.e. "watch me, do what I do!), and feedback (i.e. "was that your LOUD voice?" "Do you think you can be louder?" as well as asking other participants to rate their loudness) were employed to elicit proper loud phonation and calibrate the patient so they became accustomed to using the effort of LOUD as their 'new voice'. Each participant produced between 5-7 individual 'ahs' during this 'warm up' time,

A fundamental frequency range task was then completed using the same system of modelling and shaping individual productions. Using the same effort as in their sustained 'ahs', participants were instructed to individually glide or step pitch as high and low as possible. Clinicians listened for inappropriate pitch breaks or glottal fry and shaped appropriate high and low phonation through modelling, cueing, and feedback.

The third warm-up activity consisted of repetition of functional phrases. All participants were instructed to create a list of 10 sentences which they use every day, as is done in the LSVT method. During the first week these phrases were altered as necessary to ensure they were truly functional for each participant. Participants took turns reading their phrases in a high effort, loud voice. Modelling, cueing, and feedback were provided throughout practice.

The decision to maintain individual practice during warm ups was done purposefully and differently from the method of the Searl et al. (2011) program in which, after an initial individual practice period, all group members repeated these same warm-up activities in chorus. In the currently reported project, it became quickly apparent that choral repetition was difficult to moderate, and those with less impaired volume 'drowned out' more aphonic participants, thus making individual feedback and support more difficult. It was also felt subjectively that through listening to other group members' productions, participants became more motivated to push their own vocal loudness and produce a higher level of vocal effort. See Table 4 for a detailed summary of differences between the Searl et. al study and the current project.

Hierarchy of Practice

Following warm ups, a series of hierarchical tasks meant to mimic conversation were then completed. A summary

Table 4. Comparison of Searl et al. (2011) study and current project's treatment protocols. Only differences in protocols are provided; similarities are excluded from this comparison.

	Searl et. al	Current project
Participants	15 participants with PD 1 group	10 participants with PD 2 groups (5 participants each)
Session Frequency	1x/week	3x/week
Session Duration	90 minutes	80-90 minutes
Session Format	1) Warm up phase included choral reading of 20 functional phrases chosen by S-LP 2) In hierarchy of practice, 75% time dedicated to choral reading, 25% to individual or group responses	1) Warm up phase included individual reading of 10 functional phrases chosen by each participant 2) In hierarchy of practice, 25% of time dedicated to choral reading, 75% to individual or group responses
Format of Practice and Feedback	During warm up tasks, S-LP calibration of participant loudness is based on single sustained phonation, high, or low production. Once participants were considered calibrated, choral practice employed for remainder of warm up time. Clinician modelling and verbal reinforcement and encouragement of participants' louder voice throughout tasks. Feedback provided primarily based on productions in choral tasks. Re-energizer' activity (5-10 long loud ahs) completed as a group if sufficient loudness not being used during tasks.	During warm up tasks, SLP calibration of participant loudness within and across each production of sustained phonation, high or low. Individuals practice greater focus, with minimal choral practice employed during warm up time. Clinician modelling and verbal reinforcement and encouragement of participants' louder voice throughout tasks. Feedback provided primarily based on individual tasks, with frequent elicitation of opinions of other group members re: acceptable loudness. Individuals prompted to increase loudness through re-calibration (production of long loud 'ah' until appropriate loudness achieved) during tasks.
Homework	1) Consisted of warm ups and repetition of hierarchy of practice task completed that week in therapy. 2) No carry over tasks.	1) Consisted of warm ups and oral reading. 2) Individual carryover tasks assigned for each day not receiving therapy.
Evaluation	1) Pre- and post-treatment participants completed Voice Handicap Index 2) pre- and post-treatment evaluation of dB SPL, maximum and minimum F0, and maximum phonation time on 5 tasks	1) Post-treatment questionnaire based on LSVT follow-up questionnaire format 2) pre- and post-treatment evaluation of dB SPL and maximum phonation time on 3 tasks
Long-term follow up	None	At 3-4 months post-treatment

of hierarchical tasks used each week is provided in Table 5. As in LSVT, the goal of these tasks was to steadily increase the demands of duration to maintain loudness in gradually more cognitively complex tasks. During the first three weeks, all tasks were completed individually and participants were cued to use the same effort and loudness as they had during warm ups. In the final week, attempts were made to stimulate natural conversation, with turn taking and interruptions as in regular interactions and diminished, nearly absent clinician prompting. These conversations were occasionally recorded and immediately played back to the group to encourage peer and self-ratings of vocal loudness, in keeping with the LSVT method's use of feedback to improve self-monitoring (Fox et. al, 2002; Simberg et al., 2012).

The final portion of therapy was dedicated to reading aloud. Length and complexity of reading progressed over the course of treatment, beginning with reading single word lists and culminating with individually selected texts. For the first two weeks participants took turns reading aloud individually so that each read for approximately 3-5 minutes. In the final two weeks participants were split into pairs – each participant was matched with an S-LP or SLT, SLT student or other participant and took turns reading aloud for a total of approximately 10 minutes of sustained reading per participant. Verbal feedback took the form of encouragement to 'keep pushing', to 'be loud' etc.

In the LSVT method, greater time is dedicated to reading than to 'off the cuff' conversation. The time allotment in this group format was reversed, so that more time was spent in hierarchical conversation tasks than structured reading tasks. One of the advantages of group format therapy is that it closely matches real-world communication; as such it was decided to deliberately spend more time capitalizing on this and practicing vocal loudness in naturalistic (conversational) tasks, rather than in reading.

2.2.5 Homework

All participants completed one 15-20 minute session of home practice on days when they received therapy, two sessions on days without treatment. Homework consisted

Table 5. Examples of hierarchical conversation tasks by week. Tasks were based on activities in aphasia workbooks, current events, and interests identified by group participants

Week	Tasks used	Example	Conversation level	Response type elicited
1	- synonyms - opposites - naming to category	"What is the opposite of happy?" "Tell me three things that are red"	Single words	Individual response
2	- similarities & differences - proverb completion - errors in phrases	Tell me one thing that is the same and one thing that is different about a candle and a lamp - Complete this saying "A bird in the hand _____" - Correct this sentence "she drank a glass of paint"	Phrase level	Individual responses
3	- mixed up sentences - hypothetical situations	- Put the words in this sentence in order "Feeling I happy am" - Why do we use seatbelts?	Sentence	Individual
4	Conversation on topics of personal interest	Who do you think will win the world cup this year?	Conversation	Group

of 10 repetitions of each warm-up task and 5-10 minutes of oral reading. For the first 3 weeks reading material of increasing complexity was provided. In the last week participants chose their own reading material. Participants were required to complete a recording form for each day of therapy, which was reviewed on the following day of therapy to ensure homework was being completed. As there was a reduction in the intensity of treatment during group sessions, homework time was slightly increased compared with the LSVT method in an attempt to balance the intensity of practice per day. At each treatment session participants were reminded that home practice was essential for improving their vocal function. The importance of establishing a routine of practice that should continue even after treatment had finished was emphasized when participants were given their homework assignments, and the 'use it or lose it' principle was repeated in every session.

In addition to homework, each participant was given one carry-over task per day of treatment. The purpose of these tasks was to assist with generalization of vocal loudness principles into communication activities of daily living. Carry-over tasks were individually tailored and became more cognitively complex and lengthy as weeks progressed. Table 6 provides examples of carry-over tasks used over the course of treatment. As participants were only seen 3x/week, and given the time restrictions of group format therapy, a single carry-over task was assigned to be repeated for 2-3 days between group sessions. This was done differently from the LSVT method in which a unique carry-over task is assigned every day for 30 days.

2.2.6 Calibration & Feedback

In the LSVT program, the concept of 'calibration' is heavily emphasized. Calibration refers to when "[the] patient knows and accepts the amount of effort needed to consistently produce a louder voice. [Calibration is when a] relationship between increased vocal effort and vocal output [is] established" (LSVT Global LLC, 2008). The goal is for participants to produce a louder voice automatically in their daily life, and to be aware that this louder voice improves their communication. Calibration in LSVT is embedded throughout education, daily tasks, carry-over, and homework activities.

The group protocol described here attempted to mimic LSVT techniques by similarly embedding opportunities for calibration throughout the treatment program elements. During the education portion of each session a visual diagram and brief summary of 'why LOUD matters' was offered; participants were encouraged to comment on these concepts based on their own experiences as treatment progressed. Throughout warm up and hierarchical tasks participants were encouraged to self- and peer-evaluate loudness and to comment on that loudness' impact on quality of communication within the group (i.e. "could you hear Mr. X better when he used his loud voice?"). Audio recordings both during conversation tasks and evaluation were played back to participants so that they might also hear their own louder voice and be further calibrated to the impact of loudness on their speech. Finally, attempts were made to make daily carryover tasks

Table 6. Examples of carryover tasks.

Week	Conversation Level	Example
1	Words	Answer the phone in a loud voice Say hello to your grandchildren in a loud voice
2	Phrase	Order your lunch in a loud voice. Ask your grandchildren about their day at school in a loud voice.
3	Sentence	Give all instructions to the television repairman in a loud voice. Read a short book to your grandchild in a loud voice.
4	Conversation	Stay loud for the duration of lunch with your niece. Read a passage at Bible Study in a loud voice.

as functional as possible, based on each participant's activities of daily living and the communication goals they had expressed during the pre-treatment evaluation so that the impact of a louder voice on quality of communication life might be made most salient for each participant. Due to the group structure, there was limited time to discuss how these carryover activities had gone and how family or community members were responding to each participant's new, louder, voice. This resulted in a natural reduction in individual calibration time compared with the LSVT program.

2.2.7 Caregiver training

One of the criteria for acceptance into this program was the presence of a caregiver who was able to bring participants to and from therapy each day, and would be available to support home practice. In order to capitalize on the presence of these caregivers, an education session was held for the caregivers of each of groups A and B at the mid-point of each group's treatment schedule (end of week 2). During this education session, caregivers were taught the principles of 'thinking loud' and how these principles can impact overall vocal loudness and speech clarity. They were introduced to techniques used in therapy and a brief question and answer period was offered. Sessions were scheduled to precede group therapy, and all caregivers were then invited to attend the therapy session in order to observe practice more closely. During this therapy session caregivers were invited to engage in aspects of practice with their PD partner while the S-LP moved between partners and provided feedback. Despite emphasizing to all caregivers that their presence at the education session was mandatory only 50% of caregivers attended their respective education sessions.

2.3 Evaluation

We measured participants' vocal loudness (expressed as decibels of sound pressure, or dB SPL) in the three different tests: Sustained Phonation, Phrase Repetition, and reading of standardized passage (the Grandfather Passage). We administered each test at three different times: prior to therapy in a Pre-Treatment session, Immediately Post-Treatment, and in a Follow-Up session. An interview format questionnaire was also completed with participants during Follow-Up evaluation. Follow-Up sessions were completed on one day, which fell between 3 and 4 months post-treatment for all participants to accommodate their vacation schedules. Despite this logistical accommodation, attrition was still evident as only 7 of 9 participants attended Follow-Up evaluation.

At each evaluation, participants were also recorded stating their name and address using a loud voice as practised in therapy. These recordings were then played back to participants; immediately post-treatment and follow-up sessions provided the opportunity to listen to and compare their voice with pre-treatment recordings. Participants were then questioned as to whether they noticed a change in their vocal loudness and whether they felt positive about this change.

Because the follow-up session presented an opportunity to 'refresh' vocal strategies taught during treatment, subjects were cued to focus on loudness during Follow-Up evaluation. While this was done to meet the overarching objectives of the therapy, we recognize that it may have introduced some sampling bias into the data collection.

A Student's t-test for paired data was used to assess the significance of improvements. We compared pre-treatment results to the tests administered immediately post-treatment and compared pre-treatment results to the tests administered in follow-up.

In addition to vocal loudness, we recorded duration (in seconds) of sustained phonation and compared results of pre-treatment to immediately post-treatment and results of pre-treatment to follow-up.

Sound pressure level was measured using a Check Mate SPL meter, placed at a distance of 30 cm from the side of the participant's mouth. Placement to the side of the mouth was necessary as participants were required to read phrases from a sheet of paper placed directly in front of them, and their viewing of this would have been impeded if the SPL meter had been placed directly in front of the mouth. All measurements were taken in an office that was not soundproofed or controlled for background noise, although caution was taken to have comparable conditions for all measurements (window closed, participant in same spot in the room, no conversation in hallway). Maximum phonation time was measured using a Sportline stopwatch over 3 trials of sustained phonation 'ahs'. Recordings of name and address were done using a TeleMax TSVR2 Digital Voice Recorder, placed at 30 cm from the participant's mouth.

3.0 Results

Figure 1 provides a summary of overall group vocal loudness changes from pre-treatment to immediately post-treatment to follow-up in our 3 measures.

3.1 Pre to Post-treatment Analysis

Comparison of vocal loudness between Pre-Treatment

and Immediately Post-Treatment reveal a mean increase of 13.9 dB SPL (8.5 SD) for Sustained Phonation, 9.5 dB SPL (6.2 SD) for Phrase Repetition, and 10.5 dB SPL (4.9 SD) for Grandfather Passage. In these results we identified apparent improvements in vocal function across all three tasks following one month of intensive group format voice treatment. Average duration in sustained phonation increased by 5.56 seconds, suggesting that treatment also provides an immediate improvement in the duration of sustained phonation time. Table 7 summarizes these results. Results of our student's t-test support these conclusions with 97.5% confidence.

3.2 Long-term follow up

Comparison of pre-treatment to follow-up results indicates that participants maintained gains of almost 8 dB SPL (8.5 SD) in sustained phonation; they also maintained an average improvement in duration of sustained phonation of 0.8 seconds. Results of our student's t-test support these conclusions with 97.5% confidence. See Table 8 for a summary of these results.

In contrast, the improvements made in phrase repetition and grandfather passage tasks did not appear to be as durable after the 3-4 month follow-up period had elapsed. Mean phrase repetition level vocal loudness at follow-up was greater than pre-treatment by 3.3 dB SPL (6.2 SD), and mean grandfather passage loudness at follow-up was greater than pre-treatment by 3.9 dB SPL (4.9 SD); however these differences were not significant at 97.5% confidence.

In sum, the results outlined above suggests that although participants do make strong gains in vocal loudness immediately following group therapy, there is a trend of return towards baseline at longer-term follow-up (Figure 1).

3.3 Qualitative Data

An interview format questionnaire was completed with each participant at follow-up evaluation to obtain information on participants' subjective impressions of the effectiveness of therapy. Participants were asked open- and closed-ended questions (i.e. "Did you experience a change in voice after treatment? Please describe") by the Canadian S-LP and their responses were recorded. Caregivers were not present for this interview, therefore are not suspected to have influenced participants' responses to questions, though participants may have been inclined to judge the program more favourably given that the clinician who had

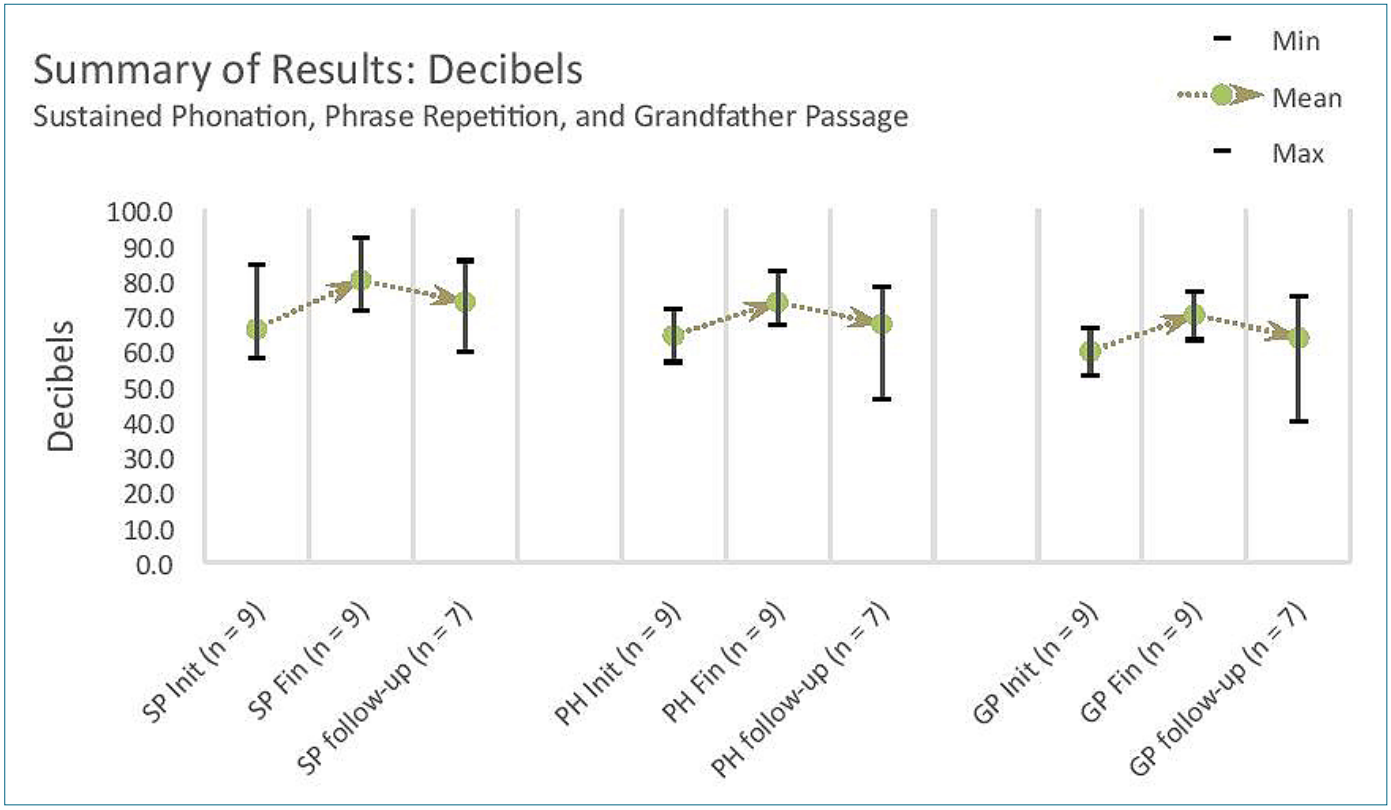

Figure 1. Changes in vocal loudness (dB SPL) averages across participants in each evaluated condition at Pre-Treatment, Immediately Post-Treatment and at 3-4 month Follow-Up.

Table 7. Vocal intensity and duration sustained phonation comparison pre- to post- treatment

Comparison	Mean (SD)	t-value	Significance (one-tailed)
Decibels of Sound Pressure (dB SPL) Pre- vs. Post-Treatment			
Sustained Phonation	66.2 (8.5) vs. 80.1 (8.5)	8.07	0.000020
Phrase Repetition	64.3 (6.2) vs. 73.8 (6.2)	7.42	0.000037
Paragraph Reading	59.8 (4.9) vs. 70.3 (4.9)	7.13	0.000050
Duration (sec) Pre- vs. Post-Treatment			
Sustained Phonation	9.8 (4.9) vs. 15.6 (4.9)	5.56	0.000268

Table 8. Vocal intensity and duration sustained phonation comparison pre-treatment to follow up

Comparison	Mean (SD)	t-value	Significance (one-tailed)
Decibels of Sound Pressure (dB SPL) Pre-treatment vs. Follow-Up			
Sustained Phonation	66.2 (8.5) vs. 73.9 (8.5)	2.50	0.023417
Phrase Repetition	64.3 (6.2) vs. 67.6 (6.2)	1.28	0.124708
Paragraph Reading	59.8 (4.9) vs. 63.7 (4.9)	1.11	0.155081
Duration (sec) Pre-treatment vs. Follow-Up			
Sustained Phonation	9.8 (4.9) vs. 10.6 (4.9)	2.33	0.029207

provided them with treatment was interviewing them. Results of this questionnaire are summarized in Table 9. The information gathered suggests that all participants found the group protocol to be a positive experience, and the majority noticed improvements in their vocal functioning after treatment. Many felt that at follow-up they had lost these gains and were returning to baseline vocal function. When questioned regarding continued practice 14% reported they were no longer practicing at all, and of those who continued to practice only half were doing so on a daily basis. In addition, only one participant was completing all elements of home practice at long-term follow-up. It is suspected that this lack of continued, complete home practice contributed to the decline in loudness noted from post-treatment to long-term follow-up. Lack of practice and consequent reduced reinforcement of vocal loudness techniques is also suspected to have impacted on participants' subjective observations of a return to baseline loudness post-treatment, despite the fact that statistical analyses show vocal loudness remained above pre-treatment levels in the majority of cases.

Table 9. Participant responses to follow-up questionnaire at 3-4 months post-treatment; 7 of 9 participants completed this questionnaire.

Item	Response	Comments	# respondents	% of respondents
Did you experience a change in voice following treatment?	Yes		6	86%
		Loudness declined	1	14%
		Loudness improved	2	29%
		Loudness improved initially, then declined	3	43%
	No		1	14%
Was treatment helpful?	Yes		7	100%
	No		0	0%
Following treatment do you speak...		More	6	86%
		Less	1	14%
What do you do in order to be understood?		Try to speak clearly/ articulate well	3	43%
		Repeat myself	1	14%
		Speak/think 'loud' (without S-LP prompting response)	3	43%
		Speak/think 'loud' (S-LP prompting response)	3	43%
		Concentrate on what I am saying	1	14%
Are you still practicing?	Yes		6	86%
		Daily	3	43%
		3 – 4x per week	1	14%
		1 – 2x per week	2	29%
	No		1	14%

What parts of the practice do you do?		Sustained ah	5	71%
		High/lows	3	43%
		Functional phrases	1	14%
		Reading aloud	6	86%
		Other	2	29%

3.4 Individual Results & Exploratory Description

Given the small n of this project, the lack of experimental control and the variability in participants, group results may offer limited validity. As such, individual results were also evaluated for any trends that might help guide future treatment designs. Figure 2 provides descriptive analyses of individual participant characteristics and overall loudness changes from Pre-Treatment to immediately Post-Treatment and to Follow-Up in our 3 measures.

Comparison of these data suggests that several factors may influence short and long term gains made in group therapy; namely severity of vocal impairment, degree of caregiver support and cognitive status.

Severity of vocal impairment did not appear to significantly impact short-term results as indicated by the improvements of both minimally impaired participants (1 & 3) and those with severe impairments (participants 2 & 6). The significant drop from post-treatment to follow-up for those with severe vocal impairment (i.e. participant 6), however, suggests that this may be a factor that negatively impacts on long-term maintenance of gains.

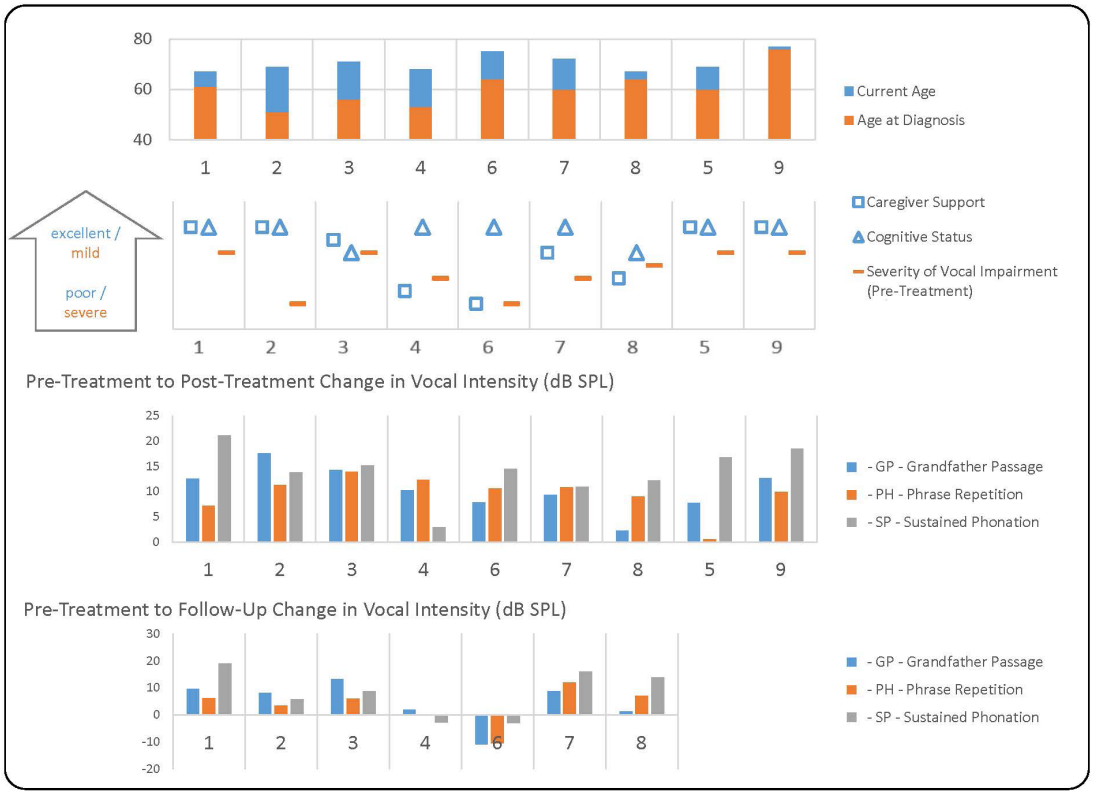

Figure 2. Individual participant characteristics and changes in vocal loudness (dB SPL) at Pre-Treatment, Immediately Post-Treatment and at 3-4 month Follow-Up. Note that participants 5 & 9 are placed at the end of the graphs, as they were not present for Follow-Up evaluation and so have incomplete data sets compared to the other participants.

The presence of strong caregiver support may help to mitigate the negative impact of vocal severity and allow for maintenance of long-term functional gains, as in the case of participant 2 (severely impaired but retained gains compared to pre-treatment levels, though lower than at immediately post-treatment) versus participant 6 (severely impaired and declined from pre-treatment levels at follow-up, with relatively poor caregiver support). Poor caregiver support may in fact have a greater impact than vocal severity when measuring long-term maintenance of gains as suggested by the results of participant 4, who, in comparison with participant 2, started treatment with only a moderate degree of vocal impairment and appeared to benefit at post-treatment from therapy, but had weak caregiver support and declined to lower that pre-treatment levels at follow-up.

Cognitive status may also impact long-term outcomes, as both participants with mild cognitive impairments (3 and 8) showed a large drop in gains from post-treatment to follow-up. It may be, however, that cognitive status is not in itself what causes the drop, but rather, that changes in cognition may impact on understanding of the protocol and importance of home practice, resulting in a reduction in gains in the long-term. Table 10 summarizes how participants were maintaining home practice at follow-up, and to what degree they had retained the single focus of LOUD to help improve their intelligibility in conversation. In the cases of participants 3 and 8 neither maintained consistent or correct home practice at Follow-Up.

In summary, individual analyses suggest that severity of vocal impairment at pre-treatment, in combination with

Table 10. Individual responses to follow-up questionnaire items which probed how well participants had internalized the single treatment focus of LOUD and the degree to which they were maintaining appropriate home practice at 3-4 months post-treatment.

Subject	Questions		
	"What do you do in order to be understood?"	"How often are you practicing?"	"What parts of the practice do you do?"
1	Try to be LOUD (unprompted)	1-2x/day	Sustained ahs
			highs & lows
			Reading aloud
2	Repeat myself	2x/day	Sustained ahs
			Functional Phrases
	Try to be LOUD (unprompted)		Reading aloud
3	Speak clearly	Not at all	n/a
	Do my exercises		
	Try to be LOUD (prompted)		
4	Try to concentrate and relax	4x/week	Reading aloud
			Repeat words that are hard to pronounce
5	Did not attend follow-up evaluation		

6	Increase my effort	2x/day	Sustained ahs
	Try to be LOUD (unprompted)		Reading aloud
7	Speak clearly	2x/week	2 Sustained ahs
	Try to be LOUD (prompted)		1 high, 2 low
			Reading aloud
8	Speak clearly and slowly	2x/week	Sustained ahs
	Try to be LOUD (prompted)		Reading aloud
9	Did not attend follow-up evaluation		

quality of caregiver support and, perhaps to a lesser degree, cognitive status, may all impact on participant success in a group treatment context. Age and time since diagnosis do not appear to have an impact.

4.0 Discussion

This pilot project provided a group format intensive voice treatment program, modelled on the LSVT principles, for PD participants in Santiago, Chile. Results suggest that there are improvements in vocal SPL and duration of sustained phonation immediately following this group therapy protocol. Unfortunately these gains appear to diminish over the ensuing 3-4 months. These results are comparable to those of other group format studies of a similar nature and further add to the body of literature that suggests that group therapy may be a viable option for providing voice treatment to some patients with PD. It may be that further adaptations to the group format program can improve long-term maintenance of vocal loudness.

4.1 Benefits of group format treatment

Public health care speech-language pathologists and the PD population they serve may benefit from treatment options where more patients can be offered services at once, such as in group therapy programs. LSVT requires a minimum of 4 hours of direct client time per week, yet Miller et al's 2011 survey reports that S-LPs are only providing an average of 45 minutes per week, suggesting that clinicians may not be able to provide the frequency and intensity of therapy required for LSVT. In contrast, the currently described project demands an average of 50 minutes per patient per week (270 treatment minutes per week/5 patients = 54 minutes per patient per week), making group treatment an efficient per patient service delivery mode that more closely matches the current realities of S-LP caseloads.

In addition, there may be benefits to a group format that are not achievable in 1:1 programming. Psychosocial benefits of group programs in general have been documented in the literature and positive effects of group format treatment in PD have also been described (Elman & Bernstein-Ellis, 1999; Searl et. al, 2011). Similar benefits were noted in the current project, as participants reported feeling supported and encouraged by others in the group. All participants interviewed at follow-up reported feeling that the group protocol had helped them, despite the fact that nearly 60% felt their vocal loudness had declined since immediately post-treatment. Participants described feeling more comfortable in social situations and having a general sense that communication with others was easier. It is possible that this newfound ease in communication was not only due to changes in vocal loudness, but also in part to the naturalistic practice environment of the group treatment program, which offered participants the opportunity to practice communicating with others using treatment techniques in a safe, supportive environment. Subjective observation by program S-LPs also suggests that when participants observed others performing high effort tasks this increased their motivation and resulted in a higher level of effort than participants might have produced otherwise. Since high effort is an important component of LSVT (Ramig et al., 1995; Sapir et al., 2007; Trail et. al, 2005), this may be an unintended benefit of group format protocols. In their summary of speech treatment in PD, Trail et al. (2005) note that patients often feel that they are shouting when cued to speak more loudly, a phenomenon echoed by others in the literature (Kwan & Whitehill, 2011; Mollaei et al, 2013). In the current project peer feedback and recordings throughout group sessions were thought to have helped to mitigate this phenomenon, as participants had the opportunity not only to listen to their own voice, but also to hear from others with PD that their new, louder voice did not sound like a shout.

4.2 Challenges faced

Organization of session plans and resources was a lengthy process resulting in many hours of non-billable preparatory work. While necessary for the initial administration of any program, the dedication of such large amounts of preparation time in the long term may not be feasible or desirable. It is felt, however, that many elements of the pilot program could be easily reused for future groups thereby reducing this non-billable planning time, though a certain amount of adaptations to the interests and needs of each group would likely always be necessary.

When compared with delivery of 1:1 LSVT, this program was unable to provide the same level of intensity and specificity of feedback during therapy tasks. The LSVT protocol requires the use of frequent, specific, individualized feedback and "functionally relevant exercises to capitalize on neuroplasticity of impaired neural systems" in order to achieve improvements in functioning (Halpern et al., 2012, p 355). In a group format, intensity and specificity of feedback are naturally reduced. Though models, cueing, and feedback were provided in a manner consistent with LSVT (initially with every trial of every task, then gradually reduced over time and across sessions), owing to the group format participants received fewer instances of individual feedback per session than occur in LSVT individual sessions. This reduced intensity of individualized feedback may contribute to lower mean gains in vocal loudness compared with the improvements typically noted in LSVT. Attempts were made to mitigate this reduced feedback by including a second SLT and two SLT students to support clients during this pilot program. Increased caregiver involvement and education may have also benefited clients as these caregivers could have ensured consistent feedback was being provided outside of therapy sessions.

The challenge of transportation to and from therapy is an often-noted barrier to treatment in the PD population and was evident in this project as well. While attempts were made to ensure all participants had reliable transportation, some participants missed one or more sessions. In a short, intensive therapy program like this, one missed sessions may have impeded or reduced positive outcomes.

In order to promote generalization and maintenance of gains, homework and daily practice is emphasized in LSVT (Howell et. al, 2009; Trail et. al, 2005). This group model attempted to emphasize the importance of continued practice as well however in LSVT, homework is reviewed each day and there is an opportunity to discuss challenges and successes the participant faced during the previous day(s) home practice. In the group protocol, individual check-ins of this nature were reduced in frequency and intensity due to time constraints, though all participants were required to keep a log of their home practice to ensure that it was happening on a daily basis. Given that questionnaire results indicate the majority of participants either did not continue with all elements of home practice, or did not continue with home practice at all after treatment had ended, it may be that the group format's reduction in individual 'check-ins' about home practice success impacted on this lack of practice. Lack of continued practice is suspected to have had an impact on the decline in vocal loudness from post-treatment to follow-up, and should be considered as a limitation of the currently presented project. Increasing time for homework review, or changing the format of the homework log may help mitigate this issue in future groups.

Finally, it is also suspected that not all participants benefit equally from a group therapy protocol. In this study, it appeared that a combination of severity of vocal impairment at pre-treatment, degree of caregiver support, and cognitive status all might have impacted on overall treatment outcomes. Consideration could be given to trialling variations of group composition based on these participant characteristics. For example, having only mild or moderately vocally impaired individual in a group, screening for any cognitive changes and excluding such participants, or altering the caregiver training and participation in group sessions might all result in improved short and long term gains. Other considerations for group profiles might include education, past treatment experiences or other social, medical, or cultural factors that might impact on participation. Further investigation would be helpful in determining which patient profiles benefit most from a group treatment format.

4.4 Conclusions & Limitations

Speech-language pathologists require options for delivering effective and efficient voice therapy services to patients with PD. The pilot protocol results described here indicate that service delivery in a group format may be a valid and effective means of improving vocal function for some patients with PD. With further revision of the homework and session structures, and consideration of revision of exclusionary criteria for group participation, it is believed that improvements could be maintained more long-term as well.

As this was a pilot program and not a true research study there were no control groups, and no randomization

or blinding of participants or S-LPs. There was limited ability to control the testing environment, and cueing for loudness was occasionally employed during post treatment evaluations. The results shared here must be interpreted with caution as this lack of controls may have impacted on measurements taken and could reduce the reliability of results. The small sample size must also be considered, as does the fact that statistical analyses completed assumed normality, which may not be the case in actuality. Sustained phonation was only measured on 3 trials in a single data collection session, and all data were captured on a single data collection session per participant per phase. Knowing that there can be substantial variation in performance within and across trials, data may not have properly captured participants' abilities. The population described here was also Chilean and there may therefore be cultural, demographic, and linguistic variables not accounted for in this report, which could impede generalization to other therapy environments. Finally, while the LSVT certified S-LP who administered this protocol is conversationally fluent in Spanish, there were occasions in which language differences could have impeded the effectiveness of treatment administration, potentially confounding results.

Despite these limitations, it is felt that the positive results described here offer a preliminary indication that group treatment may be a viable voice therapy alternative for some patients with PD. In the overburdened Canadian health care system, creative and innovative ways of providing voice therapy need to be developed. Other more rigorous studies will need to be conducted in order to draw any clear conclusions about the validity of group format therapy in treating voice disorders in PD.

References

Baylor, C., Burns, M., Eadie, T., Britton, D., & Yorkston, K. (2011). A qualitative study of interference with communicative participation across communication disorders in adults. *American Journal of Speech Language Pathology, 20*(4), 269-287.

CAOT, CPA and CASLPA Steering Committee of the Interprofessional Caseload Management Planning Tool in Occupational Therapy, Physiotherapy and Speech-Language Pathology in Canada. (2009). *The development of an interprofessional caseload management planning tool in occupational therapy, physiotherapy and speech-language pathology in Canada.* Ottawa, ON: Burnett, D., & Klaiman, D.

Chenausky, K., MacAuslan, J., & Goldhor, R. (2011). Acoustic analysis of PD speech. *Parkinson's Disease, 2011,* 11. doi: 10.4061/2011/435232.

Constantinescu, G., Theodoros, D., Russell, T., Ward, E., Wilson, S., & Wootton R. (2010). Assessing disordered speech and voice in Parkinson's disease: A telerehabilitation application. *International Journal of Language and Communication Disorders, 45*(6), 630-644.

Constantinescu, G., Theodoros, D., Russell, T., Ward, E., Wilson, S., & Wootton, R. (2011). Treating disordered speech and voice in Parkinson's disease online: A randomized controlled non-inferiority trial. *International Journal of Language and Communication Disorders, 46*(1), 1-16.

Elman, R. J., & Bernstein-Ellis, E. (1999). The efficacy of group communication treatment in adults with chronic aphasia. *Journal of Speech, Language, and Hearing Research, 42*, 411-419.

Fox, C., Ebersbach, G., Ramig, L., & Sapir, S. (2012). LSVT LOUD and LSVT BIG: Behavioral treatment programs for speech and body movement in Parkinson disease. *Parkinson's Disease, 2012*, 2. doi: 10.1155/2012/391946.

Fox, C., Morrison, C., Ramig, L. O., & Sapir, S. (2002). Current perspectives on the Lee Silverman Voice Treatment (LSVT) for individuals with idiopathic Parkinson disease. *American Journal of Speech-Language Pathology, 11*, 111-123.

Halpern, A. E., Ramig, L. O., Matos, C. E. C., Petska-Cable, J. A., Spielman, J. L., Pogoda, J. M., ...McFarland, D. H. (2012). Innovative technology for the assisted delivery of intensive voice treatment (LSVT LOUD) for Parkinson disease. *American Journal of Speech-Language Pathology, 21*, 354-367.

Homedes, N., & Ugalde, A. (2005). Why neoliberal health reforms have failed in Latin America. *Health Policy, 71*, 83-96.

Howell, S., Tripoliti, E., & Pring, T. (2009). Delivering the Lee Silverman Voice Treatment (LSVT) by web camera: A feasibility study. *International Journal of Language and Communication Disorders, 44*(3), 287-300.

Kwan, L. C., & Whitehill, T.L. (2011). Perception of speech by individuals with Parkinson's disease: A review. *Parkinson's Disease, 2013*, 1-3. doi: 10.4061/2011/389767

Liga Chilena Contra El Mal De Parkinson. (2008). Retrieved from http://www.parkinson.cl

LSVT Global Inc. (n.d.) Find a clinician. Retrieved from http://www.lsvtglobal.com/clinicians

LSVT Global, LLC. (May 2008). *LSVT LOUD Training and Certification Workshop Binder*. Workshop conducted in Victoria B.C., Canada.

Majdinasab, F., Karkheiran, S., Moradi, N., Ali Shahidi, G, Salehi, M. (2012). Relation between Voice Handicap Index (VHI) and disease severity in Iranian patients with Parkinson's disease. *Medical Journal of Islamic Republic of Iran, 26*(4), 157-163.

Miller, N., Deane, K. H. O., Jones, D., Noble, E., & Gibb, C. (2011). National survey of speech and language therapy provision for people with Parkinson's disease in the United Kingdom: Therapists' practices. *International Journal of Language & Communication Disorders, 46*(2), 189-201.

Mollaei, F., Shiller, D. M., & Gracco, V. L. (2013). Sensorimotor adaptation of speech in Parkinson's disease. *Movement Disorders 28*(12), 2. doi: 10/1002/mds.25588.

Ramig, L. O., Countryman, S., Thompson, L. L., & Horii, Y. (1995). Comparison of two forms of intensive speech treatment for Parkinson disease. *Journal of Speech and Hearing Research, 38*(6), 1232-1251.

Sáez, D. (2008). El sistema de garantías explícitas en salud y la neurología [Neurology and the health explicit guarantees system]. *Revista Chilena de Neuro-Psiquiatría, 46*(4), 253-254.

Sackley, C. M., Smith, C. H., Rick, C., Brady, M. C., Ives, N., Patel, R.,...Clarke, C. (2014). Lee Silverman voice treatment versus standard NHS speech and language therapy versus control in Parkinson's disease (PD COMM pilot): Study protocol for a randomized controlled trial. *Trials, 15*(213). doi: 10.1186/1745-6215-15-213.

Sapir, S., Spielman, J. L., Ramig, L. O., Story, B. H., & Fox, C. (2007). Effects of intensive voice treatment (the Lee Silverman Voice Treatment [LSVT]) on vowel articulation in dysarthric individuals with idiopathic Parkinson disease: Acoustic and perceptual findings. *Journal of Speech, Language, and Hearing Research, 50*, 899-912.

Schrag, A., Jahanshahi, M., & Quinn, N. (2000). How does Parkinson's disease affect quality of life? A comparison with quality of life in the general population. *Movement Disorders, 15*(6), 1112-1118.

Searl, J., Wilson, K., Haring, K., Dietsch, A., Lyons, K., & Pahwa, R. (2011). Feasibility

of group voice therapy for individuals with Parkinson's disease. *Journal of Communication Disorders, 44*, 719-732.

Simberg, S., Rae, J., Kallvik, E., Salo, B., & Martikainen, K., (2012). Effects of speech therapy on voice and speech in Parkinson's after a 15-day rehabilitation course: A pilot study. *International Journal of Therapy and Rehabilitation, 19*(5), 273-285.

Skodda, S., Grönheit, W., Mancinelli, N., & Schlegel, U. (2013). Progression of voice and speech impairment in the course of Parkinson's disease: A longitudinal study. *Parkinson's Disease, 2013*, 1-7. doi: 10.1155/2013/289195.

Spielman, J., Ramig, L. O., Mahler, L., Halpern, A., & Gavin, W. J. (2007). Effects of an extended version of the Lee Silverman Voice Treatment on voice and speech in Parkinson's disease. *American Journal of Speech-Language Pathology, 16*, 95-107

Trail, M., Fox, C., Ramig, L.O., Sapir, S., Howard, J., & Lai, E.C. (2005). Speech treatment for Parkinson's disease. *NeuroRehabilitation, 20*, 205-221.

Varanese, S., Birnbaum, Z., Rossi, R., & Di Rocco, A. (2010). Treatment of advanced Parkinson's disease. *Parkinson's Disease. 2010*, 6. doi: 10.4061/2010/480260.

Vargas, V., & Poblete, S. (2008). Health prioritization: The case of Chile. *Health Affairs, 27*(3), 782-792. doi: 10.1377/hlthaff.27.3.782

Whitehill, T. L., Kwan, L., Lee, F. P.-H., & Chow, M. M. N. (2011). Effect of LSVT on lexical tone in speakers with Parkinson's disease. *Parkinson's Disease. 2011*, 1. doi: 10.4061/2011/897494.

Whitehill, T.L., & Wong, L.L.N. (2007). Effects of intensive voice treatment on tone-language speakers with Parkinson's disease. *Clinical Linguistics & Phonetics, 21* (11-12), 919-925.

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