



Longitudinal Effects of SPEAK OUT!® Therapy Group Program Among Participants with Parkinson Disease

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Purpose: Extensive literature exists about the effects of LSVT LOUD®, SPEAK OUT!®, and SPEAK OUT!® Therapy Group programs on voice and speech outcomes for individuals living with Parkinson Disease (PD). Prior studies have reported increased speech intelligibility and vocal intensity among participants with PD immediately upon completing one-on-one individual programs (including LSVT LOUD® and SPEAK OUT!® therapy). However, few researchers have reported longitudinal data on the specific effects of the SPEAK OUT!® Therapy Group program on participants' cognitive, self-reported swallowing, depression, and voice-related quality of life (QoL) status. Therefore, the current study examined the effects of SPEAK OUT!® Therapy Group participation for fourteen participants with PD in multiple domains, including cognition, self-reported swallowing status, depression, and voice-related QoL across two years.

Methods: Data were collected at six-month intervals over two years. Participants included a treatment (TX) group that attended weekly SPEAK OUT!® Therapy Group sessions and a control (CN) group that did not receive any speech therapy services for their PD symptoms.

Results: No statistically significant group differences were found for the different measures. However, descriptive statistics showed maintenance, rather than decline, in the TX group for cognition and other domains compared to the CN group at the end of two years. In contrast, the CN group demonstrated a slight cognitive decline during the same period.

Conclusions: The current study provides evidence of possible slow progression of non-voice domains such as cognition, self-reported swallowing, and depression after participating in the SPEAK OUT!® Therapy Group program. However, additional studies are warranted.

Keywords: Parkinson disease, Cognition, Group-based speech therapy, Depression, Voice-related quality of life



Received: June 20, 2024

Revision: March 19, 2025

Accepted: April 20, 2025

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INTRODUCTION

Approximately one million people in the United States are living with Parkinson Disease (PD), a progressive neurological disorder that affects movement, speech, voice, swallowing, cognition, and mood [1]. The authors observed that individuals participating in SPEAK OUT!® Therapy and SPEAK OUT!® Therapy Groups (formerly called LOUD Crowd®) demonstrated increased cognitive abilities as the sessions progressed. The SPEAK OUT!® workbook and the SPEAK OUT!® Therapy Group workbook both include cognitive exercises to facilitate multi-tasking for thinking and talking at the same time. Although many studies have addressed the effects of speech and voice therapy in people with PD [2-4], such as increased speech intelligibility and vocal intensity, re-

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search about cognitive-linguistic improvements from individual and group therapy has been limited. Studies investigating the long-term impact of non-medication therapeutic interventions beyond the six months to maintain or improve cognitive functioning in people with PD are relatively few. Other areas of research interest for individuals with PD include maintenance of swallowing function, mental state, and voice. Therefore, the primary aim of this study was to identify whether or not the SPEAK OUT!® Therapy Group program improves or maintains cognitive performance, swallowing, depression, and voice-related quality of life (VRQOL) in participants with PD over two years.

Cognition is a multidimensional construct consisting of several domains. Cognitive deficits affect approximately one-quarter of people with PD who do not have a diagnosis of Parkinsonian dementia [5]. Difficulties may include poorer executive functioning as well as deficits in working memory, short-term memory, reasoning, planning, attention, semantic fluency, and naming [6]. Additionally, basic perceptual, visuo-spatial, and verbal processes are commonly impaired in individuals with PD [7-10]. Cognitive deficits associated with PD can be difficult for patients and their family members to manage. Some individuals with PD may have difficulties making decisions for complex problems, demonstrate poor safety awareness, or may be unsafe to continue driving.

There is heterogeneity in the clinical presentation and progression of cognitive deficits among individuals with PD [11]. Cognitive deficits may range from normal cognition through early mild subjective and objective decline (or mild cognitive impairment) to mild, moderate, and even severe PD dementia (PDD) [7]. The risk for developing dementia is higher with increased disease duration among individuals with PD, with a majority experiencing dementia when diagnosed with PD for ten years or longer. Specifically, about 80% of individuals with PD-MCI may transition to PDD, thereby suggesting the critical need to include targeted treatment of cognitive deficits immediately following the PD diagnosis. There is currently a lack of existing well-defined or remarkable therapy programs specifically to address the mild forms of cognitive deficits as well as PDD [12]. Few effective methods for maintaining or improving cognitive skills in people with PD have been documented in the literature. Among the existing studies, researchers have examined the use of computerized training programs [13-16], video games [17], Sudoku puzzles [18], and other paper/pencil tasks [19] that have yielded minimal and/or short-lived results in participants with PD.

Studies have indicated that increased cognitive load affects motor speech performance [19-21]. Ishikawa et al. [22] found that individual cognitive load was elevated when speaking clearly in contrast to speaking more casually. In addition, MacPherson [19] concluded that work on motor speech production should include increasing or varying cognitive demands for carryover of skills. Given these findings, work on speech intelligibility/vocal intensity may increase cognitive skills over time or the introduction of varying cognitive tasks during work on speech intelligibility and intensity, such as those introduced during SPEAK OUT!® and SPEAK OUT!® Therapy Groups may result in improvements in both domains.

The SPEAK OUT!® Therapy Group (formerly called LOUD Crowd®) is a therapeutic program that uses group-based activities to improve speech, voice, cognitive, and possibly swallowing skills in participants with PD after their participation in individual SPEAK OUT!® therapy. There are many studies about the benefits of group therapy for participants with other diagnoses, such as aphasia, including members forming positive relationships with others, developing more purpose in life, and improving environmental mastery, autonomy, personal growth, and self-acceptance [24]. A study found that participants in group aphasia therapy used more vocalizations and facial expressions than participants in individual therapy [25]. The authors also reported that the purpose of the communicative attempts appeared to be related to social interactions, resulting in closer relationships. The skills utilized in group therapy may generalize to various abilities, including improved mood and cognition. Therefore, although it is not the intended purpose, group therapy to address speech and voice in people with PD may also improve cognitive function.

Speech deficits associated with PD

Hypokinetic dysarthria is typically associated with Parkinsonian speech, with up to 86-89% of people with PD demonstrating voice changes, followed by about 45-50% demonstrating articulatory changes [26,27]. The speech of individuals with PD is commonly described as hypophonic due to respiratory and laryngeal deficits. Other possible speech problems are articulatory imprecision and prosodic deficits, including monopitch, monoloudness, timing-related deficits, and deficits related to the rate of speech [2,4].

There are a variety of speech programs for people with PD. For example, LSVT® LOUD is an individual therapy program designed to recalibrate the voice to improve volume, pitch,

and inflection [28]. SPEAK OUT!® is a separate therapy program that comprises individual therapy sessions designed to teach participants to speak with INTENT (meaning purposeful and deliberate movements), changing speech from an automatic function to an intentional task [29]. In addition to speech and voice exercises, the SPEAK OUT!® program includes daily cognitive exercises to work on thinking and speaking simultaneously. After 8-12 individual sessions of the SPEAK OUT!® program, the participants attend the SPEAK OUT!® Therapy Group, a weekly maintenance group using the same principles as SPEAK OUT!®. The groups are led by a speech-language pathologist (SLP) trained in the SPEAK OUT!® and SPEAK OUT!® Therapy Group programs. Both forms (individual SPEAK OUT!® and SPEAK OUT!® Therapy Groups) address increasing awareness of speaking with INTENT. The effects of therapy programs on speech and voice are well documented [28-32]. However, limited studies have examined the possible benefits of SPEAK OUT!® and SPEAK OUT!® Therapy Group among participants with PD for a year or longer. Most existing studies have reported outcomes of SPEAK OUT!® and SPEAK OUT!® Therapy Group based on a few weeks to up to six months [29,32], with only one study so far that has documented the impact of SPEAK OUT!® and SPEAK OUT!® Therapy Group on voice measures and VRQOL for one year period [31].

Voice-related quality of life and swallowing changes in PD

Quality of life (QOL) is a multidimensional construct with five dimensions: physical, material, social, emotional, and development and activity [33]. Health researchers have discussed dividing QOL measures into health-related and non-health-related methods. Furthermore, health-related QoL may include physical well-being. Specific to participants with PD, researchers have extensively examined and reported health-related QOL and communication-related QOL, which in turn includes VRQOL. Specifically, VRQOL refers to the effects of different communication disorders on speech and voice performance in daily life. Terms including voice handicap, voice-related disability, and VRQOL have been interchangeably used in existing literature. Researchers have examined the impact of different speech therapy programs, including LSVT® and SPEAK OUT!® and SPEAK OUT!® Therapy Group programs, on the VRQOL of participants with PD [29,32,34-36]. However, to our knowledge, limited studies have examined the long-term effects of participation in SPEAK OUT!® Therapy Groups on participants' VRQOL beyond one year.

The symptoms of dysphagia were reported by James Parkinson in his earliest descriptions of people with PD [37]. The prevalence of oro-pharyngeal dysphagia in people with PD differs across studies from 18.5 to 100% depending on the authors' definition of dysphagia, assessment tools, and assessment time point from the onset of PD diagnosis [38,39]. Approximately one-third of community-dwelling people with PD experience subjective dysphagia (dysphagia based on patient-rated questionnaires or interviews) with objective dysphagia (i.e., dysphagia based on clinician-rated observations or swallowing tests) occurring among 80% of people with PD. However, people with PD do not always report swallowing changes and/or difficulties unless asked [39].

Individuals with PD are three times more likely to have swallowing disorders when compared to neurologically healthy participants. The possible avenues of dysphagia treatment for people with PD include various rehabilitative treatments, compensatory techniques, and medical treatments. Among the existing programs, the LSVT® program has been previously reported to improve pharyngoesophageal swallow and involuntary cough functions among participants with PD [27,40]. However, to our knowledge, no prior studies have examined the possible impact of participation in SPEAK OUT!® and SPEAK OUT!® Therapy Groups on participants' self-reported or objective swallowing status. The current study only includes self-perception of swallowing function as reported by participants with PD. It is known that the underreporting of swallowing deficits among participants with PD suggests a proactive clinical approach to dysphagia. Findings from the current study can shed light on the self-perceptions of participants in the early and mid-stage PD about their swallowing skills and if participation in SPEAK OUT!® and SPEAK OUT!® Therapy Group programs provide any direct or indirect benefits to these skills.

Existing studies about SPEAK OUT!® and SPEAK OUT!® Therapy group, formerly known as LOUD Crowd®

Most existing studies on SPEAK OUT!® completed individually and SPEAK OUT!® Therapy group (formerly known as LOUD Crowd®) program completed as a group have extensively examined participants' voice and prosodic performance with PD [28-32,41,42]. By contrast, the effects of SPEAK OUT!® and SPEAK OUT!® Therapy Group on the VRQOL of participants with PD are discussed less. For example, in one of the earlier studies, Levitt and her colleagues examined the benefits of SPEAK OUT!® and the SPEAK OUT!® Therapy

Groups on both voice profiles and self-reported VRQOL in 12 participants with PD. The participants were assessed at four-time points (baseline, after four weeks, after eight weeks, and at the end of 16 weeks). The results indicated statistically significant differences in VRQOL scores with improved self-reported QOL reported by participants following the SPEAK OUT!® program and during the SPEAK OUT!® Therapy Group [30].

Behrman and her colleagues reported similar improvements in VRQOL among a larger sample size of forty participants with PD [31]. They examined the VRQOL of participants with PD and age-matched neurologically healthy participants. The participants with PD completed the SPEAK OUT!® program and the SPEAK OUT!® Therapy Group during ten weeks. All participants completed the baseline assessments during the first two weeks. The 10-week treatment period included thrice a week 40-minute sessions of the SPEAK OUT!® program for four consecutive weeks. These participants then attended a weekly SPEAK OUT!® Therapy Group for six weeks. Data were collected at baseline and within 1-6 weeks of completion of the SPEAK OUT!® program. The results indicated significant improvements on the Voice-Related Quality of Life Questionnaire for participants with PD after completing SPEAK OUT!® and during the SPEAK OUT!® Therapy Group program for participants with PD. The control group did not demonstrate any statistically significant changes in VRQOL during this period. In addition, the authors reported a gender effect, with male participants with PD showing a 5-point increase compared to female participants with PD showing only a 2-point increase [30].

Furthermore, greater PD severity and longer disease duration were associated with relatively lower improvement of VRQOL among the PD participants. In a follow-up study, Behrman et al. reported the maintenance of VRQOL ratings among participants with continued participation in the SPEAK OUT!® Therapy Group a year later [31]. The authors concluded that continued participation in the SPEAK OUT!® Therapy Group program improved the participants' emotional state, as evidenced by higher VRQOL scores at the end of the year. To our knowledge, no prior studies have examined the possible relationship between PD participants' self-reported depression following participation in SPEAK OUT!® Therapy Group, a maintenance program in a group setting with important social interaction and peer-sharing experiences.

SPEAK OUT!® and the SPEAK OUT!® Therapy Group pro-

grams include a series of voice and cognitive tasks to improve self-intent to communicate effectively. To date a few studies have examined the benefits of the SPEAK OUT!® Therapy Group program concerning cognitive functioning and self-reported swallowing. Parveen [32] examined the long-term benefits of the SPEAK OUT!® Therapy Group program on cognition, self-reported swallowing status, depression, and VRQOL in two participant groups (i.e., treatment and control). Participants included six individuals with PD in the treatment group who completed the weekly SPEAK OUT!® Therapy Group (after completing the SPEAK OUT!® individual program) and three participants with PD in the control group with no prior or current speech therapy services during the study period. Owing to the small sample size, no statistically significant group differences were evident between the two groups. However, descriptive analyses indicated a trend for improved cognitive performance for the treatment group in all areas of interest. The study mentioned above had several limitations, including small and unequal sample sizes for the treatment and control groups and a study duration of only six months.

Multiple studies of SPEAK OUT!® and SPEAK OUT!® Therapy Group report improvements in voice, prosody, and VRQOL among participants with PD. However, few studies have examined the possible cognitive improvement from these programs beyond six months, originally designed to scale vocal intensity. Further, to the best of our knowledge, only one study [31] has previously reported the longitudinal outcomes of these programs on participants' VRQOL beyond one year. The SPEAK OUT!® and the SPEAK OUT!® Therapy Group programs are unique in that they include both reading and cognitive activities to facilitate greater cortical involvement and improve the self-intent INTENT of participants with PD. They seem to work on participants' vocal performance and cognitive functioning. Therefore, the current study has a longitudinal study design to examine the possible impact of the SPEAK OUT!® Therapy Group programs on several domains, including the cognitive performance, swallowing, depression, and VRQOL of participants with PD over two years.

METHODS

Participants

Institutional review board (IRB) approval was obtained before data collection. Participants ranged between 50-80 years of age and were recruited through physician referrals and con-

venience sampling. The exact age of the participants could not be collected for the study due to the IRB guidelines of the medical setting where data collection was completed. Table 1 includes a summary of participants' demographic information. A trained physical therapist administered the Hoehn and Yahr scale during all phases of data collection. All participants scored in the mild to moderate severity on the Hoehn and Yahr (H&Y scale). The H & Y scale measures how PD symptoms and a patient's level of disability progress based on a five-point scale. Level 1 describes unilateral involvement only; Level 2 outlines bilateral involvement without balance deficits; Level 3 is mild to moderate bilateral involvement with

some postural instability. Level 4 refers to severe disability but can stand or walk unassisted, and Level 5 reports severe disability, including wheelchair or bedbound status [43].

Participants completed the SPEAK OUT!® program and transitioned to the SPEAK OUT!® Therapy Group for weekly therapy. SPEAK OUT!® Therapy Group sessions were initially conducted in a room in the local YMCA. After the COVID-19 pandemic made face-to-face sessions difficult, the group transitioned to online meetings with occasional outdoor sessions. The participants' progress was monitored for two years (January 2020-January 2022). During the study, the consistent control (CN) group participants were referred to speech ther-

Table 1. Demographic information of the participants

Participant	Age range	Gender	Time from PD diagnosis at end of study	Education	Baseline H&Y scores	Testing session phases
TX #1	70s	M	5 years	College	2.5	I, II
TX #2	70s	M	7 years	College	1	I, II, III, IV, V
TX #3	70s	M	4 years	Graduate school	2	I
TX#4	60s	M	4 years	College	2.5	I, II, III, IV, V
TX#5	70s	M	19 years	College	2.5	I, II, III, IV, V
TX#6	60s	F	3 years	College	1.5	I, II, III, IV, V
TX#7	70s	M	9 years	Graduate	2.5	I,II, III
TX#8	80s	F	4 years	Graduate	3	I
TX#9	50s	F	4 years	High school	2	I, II, III
TX#10 (CN#1)	60s	F	23 years	College	3	II
TX#11 (CN#2)	80s	M	3 years	College	1	II, III, IV, V
TX#12 (CN#3)	70s	F	6 years	College	2.5	II, III, IV, V
TX#13 (CN#10)	80s	F	3 years	College	1	V
TX#14	60s	M	12 years	College	1	V
CN#1	60s	F	23 years	College	3	I
CN#2	80s	M	3 years	College	1	I
CN#3	70s	F	6 years	College	2.5	I
CN#4	60s	M	7 years	College	2.5	I, II, III
CN#5	70s	F	3 years	College	1	I, III, IV, V
CN#6	60s	F	5 years	College	1	I
CN#7	70s	M	6 years	High school	3	I
CN#8	60s	M	7 years	College	3	I, II, IV, V
CN#9	80s	M	2 years	College	1	II, III, IV, V
CN#10	80s	F	3 years	College	1	IV
CN#11	60s	F	4 years	College	1	IV
CN#12	70s	M	1 year	College	3	IV
CN#13	60s	F	12 years	College	1.5	V

TX, Treatment group; CN, Control group.

Phase I=baseline, Phase II=6 months, Phase III=12 months, Phase IV=18 months, Phase V=24 months.

apy but declined to participate in the SPEAK OUT!® and SPEAK OUT!® Therapy Groups. Other control group participants had not yet received speech therapy services but opted to begin services after their initial testing. The baseline PD disease severity for all TX participants (excluding the three participants who moved from the control group) was 2.1, and that for the CN group was 1.8 (including all participants who stayed in this group throughout the study period). The differences were not found to be statistically significant.

Phases of data collection

This study included five phases of data collection: Phase I (baseline), Phase II (6 months), Phase III (12 months), Phase IV (18 months), and Phase V (24 months since baseline). Four TX participants participated in all five phases of data collection. In addition, three participants in the CN group transitioned to the therapeutic (TX) phase during Phase II (6 months). They remained in the TX group for the remainder of the study period. Due to the longitudinal nature of the study, around 28% (i.e., 4/14) of the TX participants and 61.5% (i.e., 8/13) of the CN participants either dropped out or were available for only one or two rounds of data collection. Table 2 includes the distribution of TX and CN participants throughout the study.

Treatment tasks

SPEAK OUT!® and SPEAK OUT!® Therapy Groups emphasize speaking with INTENT rather than loudly, as with LSVT LOUD® [28]. Exercises in SPEAK OUT!® and SPEAK OUT!® Therapy Group sessions included vocal warm-ups, such as sustained /a/ and pitch glides, counting aloud, reading sentences or paragraphs aloud, and cognitive exercises. Cognitive exercises include naming category members, performing mathematical calculations, explaining similarities/differences, and providing multiple meanings for a word. The cognitive exercises were specific to the SPEAK OUT!® and SPEAK OUT!® Therapy Group, allowing participants to practice thinking and talking simultaneously [29].

Table 2. Distribution of participants in the treatment (TX) and control (CN) groups during the different phases of data collection

Groups	Phase I	Phase II	Phase III	Phase IV	Phase V
TX	9	10	9	8	9
CN	8	3	4	7	7

Each phase included a 6-month interval.

Assessments

Data were collected from the Dementia Rating Scale-2 (DRS-2; 44), Levels of Speech Usage [45], Swallowing Disturbance Questionnaire (SDQ; 48), Beck Depression Inventory -2 (BDI-2; 46), and the Voice Handicap Index (VHI) [47] for all participants. DRS-2 is designed to assess the cognitive abilities of dementia patients, differentiate levels of ability in these patients, and track their cognitive status over time. The maximum possible overall score is 144. Lower scores indicate more impairment, with scores of 123 indicating possible cognitive deficits [44]. The assessment consists of five subscales. The Attention subscale measures working memory and the ability to attend to and follow verbal and visual commands with different complexities. The Initiation/Perseveration subscale measures verbal generative fluency, auditory articulation of patterns, double alternating motor movements, and simple graphomotor skills. The Construction subscale measures patients' ability to copy simple visual designs and write their names. The Conceptualization subscale assesses abstract concept formation skills and the ability to identify similarities and differences among objects presented visually and verbally. The last subscale is Memory, which measures orientation, recall of verbal information after a brief delay, and verbal and visual multiple-choice recognition memory [44].

The Levels of Speech Usage is a self-report scale for describing daily speech utilization, based on a five-point Likert scale, from undemanding to extraordinary speech use. Undemanding speech usage describes an individual who is quiet for long periods almost daily. Extraordinary speech usage describes an individual who regularly talks for long periods with loud or expressive speech or someone who gives presentations or performances. Lower scores indicate less consistent daily speech usage [45].

The Swallowing Disturbance Questionnaire (SDQ) is a 15-item questionnaire originally developed for use with participants with dysphagia [48]. Since aspiration pneumonia is a leading cause of death in individuals with PD [49], the questions are relevant to the daily experiences of adults with PD. The assessment was based on a four-point Likert scale: None, Seldom, Frequently, and Very Frequently. Higher scores indicated more severe swallowing deficits [48].

The Beck Depression Inventory-2 (BDI-2) is a 21-item self-report inventory that assesses the severity of depressive symptoms in adolescents and adults. The questions included ratings of sadness, life satisfaction, disappointment, social engagement, work, decision-making, sleep, and appetite. The

BDI-2 is based on a four-point Likert scale (Never, Sometimes, Almost Always, and Always). Scores range from 0 to 63, with higher scores correlating with higher levels of depression [46].

The VHI is a voice-related QoL measure. The questionnaire included questions about voice disorder's physical, functional, and emotional impact on daily functioning. It is a self-assessment with 30 questions and a five-point Likert scale (Never, Almost Never, Sometimes, Almost Always, and Always). The total possible score was 120, with higher scores indicating greater impairment and poorer voice-related QoL [47].

RESULTS

Data analysis

Due to the small sample size and non-normal distribution, non-parametric test statistics were completed in the current study. The level of significance was chosen as .05 for the study. Mann-Whitney *U* tests indicated no statistically significant differences between the two groups (TX and CN) based on cognitive performance (DRS-2 scores), speech usage (Levels of Speech usage scores), self-reported swallowing status (SDQ scores), depression (BDI-II scores), or self-reported voice related QoL (VHI scores; for all $p > 0.05$). However, interesting group trends and patterns were observed between the two groups. The following paragraphs discuss some of the key findings of the two groups.

Cognitive performance

Due to the small number of participants and unequal sample sizes of the participant groups, descriptive statistics were used

to determine group differences and possible trends. A comparison of the DRS-2 scores indicated that the TX group demonstrated similar or relatively improved cognitive skills throughout the 2-year testing period. Four of the original nine participants with PD in the TX group were available for all five phases of testing during the 2-year period. One participant (PD 02) maintained the same DRS-2 scores while two participants (PD 04 and PD 06) demonstrated improvements in the DRS-2 scores at the end of the 2-year period. However, the fourth participant demonstrated a decline in DRS-2 scores during the final phase of testing. Figure 1 shows the graphical representation of DRS-2 scores for these selected participants. Specific to the CN group, all participants exhibited lower cognitive scores than the TX group in all five phases of data collection. There was a within-group exception where the CN group demonstrated relatively improved cognitive scores from Phase III to Phase IV. For example, the group means of DRS-2 were between 135.8 and 140.1 for the TX group and 126.3 and 135 for the CN group across the five phases of data collection. Figure 2 shows the results of mean DRS-2 scores for both participant groups.

Speech usage and swallowing performance

Both groups of participants completed the Level of Speech Usage scale for all five phases of data collection. No significant group differences were observed in the reported levels of speech between the TX and CN groups, indicating a similar degree of voice use for daily living activities. Figure 3 illustrates the Speech Usage scale scores of both groups. Specific to swallowing performance, no significant differences were observed for the two groups for self-reported speech usage over two

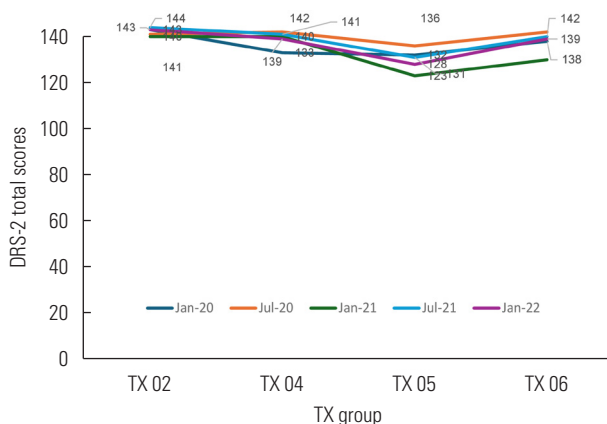


Figure 1. Graphical representation of total Dementia Rating Scale-2 (DRS-2) scores for selected treatment (TX) group participants.

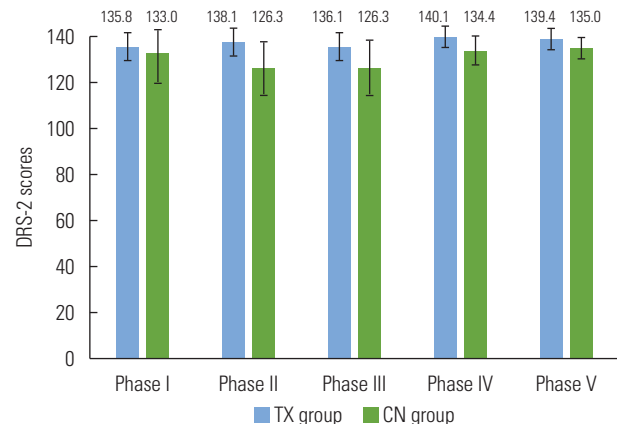


Figure 2. Graphical representation of Dementia Rating Scale-2 (DRS-2) scores for treatment (TX) and control (CN) groups.

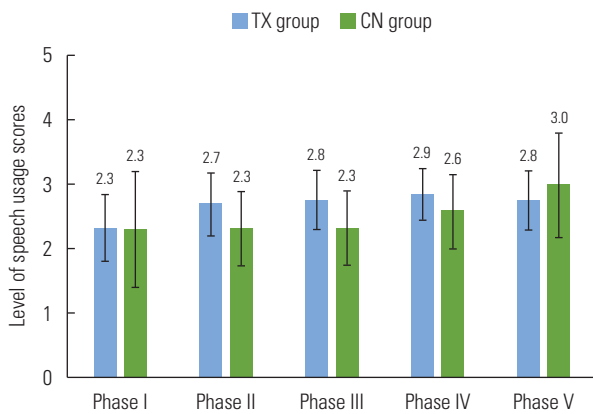


Figure 3. Graphical representation of level of speech usage scores for treatment (TX) and control (CN) groups.

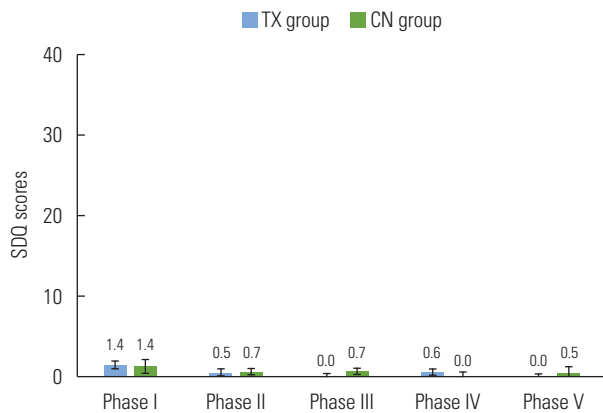


Figure 4. Graphical representation of swallowing disturbance questionnaire (SDQ) scores for treatment (TX) and control (CN) groups.

years. Specific to swallowing abilities, both TX and CN groups demonstrated a similar mean of 1.4 at baseline, indicating no group differences. During the subsequent phases, the TX group demonstrated improvements in the self-reported swallowing abilities as indicated by a lower group mean when compared to the CN group means of 0.5, 0.0, 0.6, and 0.0, respectively. Figure 4 shows a summary of the self-reported swallowing statuses of the two groups.

Depression

Depression scores indicated that the TX group initially had a higher mean than the CN group. However, the TX group had lower scores for subsequent data points than the CN group. Given the small sample size, the groups had no statistically significant differences. However, the group means suggested that the TX group self-reported relatively lower scores (i.e., less self-reported depression) than the CN group. Figure 5

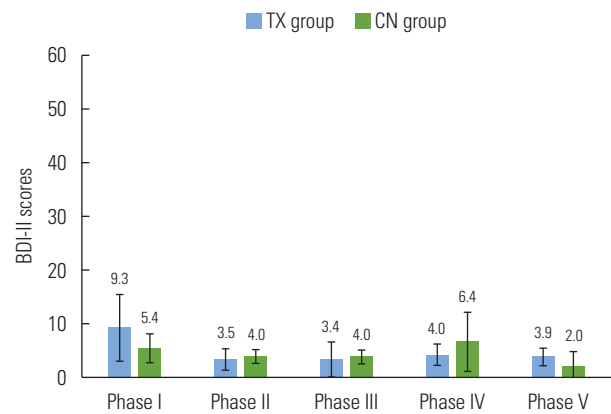


Figure 5. Graphical representation of Beck Depression Inventory (BDI-II) scores for treatment (TX) and control (CN) groups.

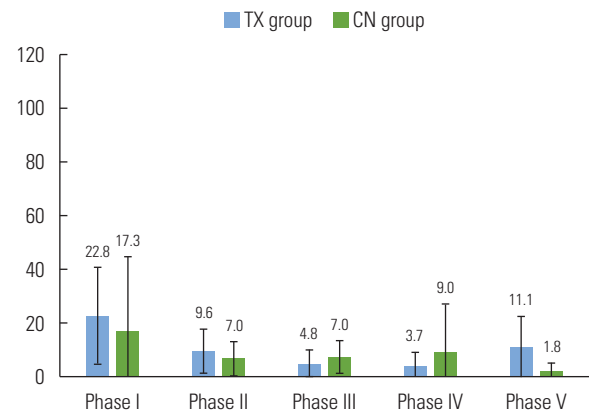


Figure 6. Graphical representation of voice handicap index (VHI) scores for treatment (TX) and control (CN) groups.

shows a graphical representation of the depression scores for the two participant groups.

VRQOL

The results of the VHI indicated that both the TX and CN groups self-reported relatively less negative impact of PD on vocal performance during the two years. Higher scores on VHI are suggestive of poorer self-reported VRQOL. The mean VHI was 22.8 out of 120 for the TX group and 17.3 out of 120 for the CN group for baseline (or Phase I). Further, the VHI means for the TX group was higher than the CN group for Phases II and V. Figure 6 shows a graphical summary of self-reported VRQOL scores for both participant groups.

DISCUSSION

The current longitudinal study examined the possible impact

of the SPEAK OUT!® Therapy Group program on cognition, speech usage, self-reported swallowing status, depression, and VRQOL of participants with PD over two years. Although the existing literature adds to our understanding regarding the short-term and some long-term impacts of SPEAK OUT!® and SPEAK OUT!® Therapy Groups on speech and voice, to the best of our knowledge, there are none to minimal studies that have addressed the long-term therapy effects of SPEAK OUT!® Therapy Group program on cognition, self-reported swallowing, or depression on participants with PD. In addition, the existing literature about effects of cognitive load on motor speech production did not examine the relationship regarding participants with PD. Although no statistically significant group differences were noted for the different domains, the study provided some interesting trends that can be helpful for SLPs working with individuals with PD.

Cognitive performance

Participants in the TX group maintained their cognitive scores during the two years compared to the CN group. In addition, all TX group participants demonstrated improved DRS-2 scores for all subsequent phases (i.e., at 6 months, at 12 months, 18 months, and 24 months) compared with the baseline status. The current study findings agree with a previous study that tracked the possible benefits of the SPEAK OUT!® Therapy Group program on the cognitive performance of participants with PD during a six-month interval [32]. The prior study also concluded that the TX group's cognitive scores improved compared to a no-treatment CN group. Therefore, the current study adds to the evidence that the cognitive activities of the SPEAK OUT!® Therapy Group, formerly known as the LOUD Crowd®, program can help maintain/improve the performance of participants with PD who are in mild-moderate disease severity.

The following section includes a detailed comparison of specific participants in the TX group who continued the program for at least a year or longer. TX participant #2 demonstrated composite DRS-2 scores of 143, 141, 140, 144, and 143, indicating maintenance of cognitive skills throughout the study. In addition, TX participant #4 exhibited an initial composite score of 133 but subsequent scores of 142, 140, 141, and 139, which improved from the initial score and were maintained for subsequent tests. Next, TX participant #06 showed similar improvement with an initial score of 138 and subsequent scores of 142, 130, 140, and 139. Finally, TX participants #7 and #9 were only tested for three periods, but they main-

tained scores of 138, 139, and 135, and 132, 139, and 135, respectively. With progressive neurological disease, it appears unlikely that participants would maintain cognitive skills for two years or demonstrate improved skills over time.

If the hypothesis that the CN group participants did not need therapeutic intervention was correct, the CN participants should have also maintained their cognitive skills over time. However, two CN participants remained cognitively stable, whereas one demonstrated a decline over time. Thus, based on the current findings, there was a trend of the TX group demonstrating relatively better cognitive performance than the CN group at the end of the 2-year period.

Swallowing performance

Participants in the TX group demonstrated no swallowing concerns specific to self-reported swallowing status during Phases III, IV, and V (i.e., at 12, 18, and 24 months). In contrast, some participants in the CN group reported minimal to mild difficulties in swallowing, as evident by the group means shown in Figure 4. The current study provides evidence that participants in the TX group had no self-reported swallowing difficulties at the end of the study. Similar positive outcomes of the weekly SPEAK OUT!® Therapy Group program on the self-reported swallowing status of participants with PD were also reported in an earlier study [32]. The possible lack of swallowing consistency in the TX group could be attributed to the increased laryngeal sphincteric activity based on weekly SPEAK OUT!® Therapy Group activities and better utilization of other compensatory strategies by the TX group. The current study adds to the limited literature on the possible effects of participation in SPEAK OUT!® Therapy Group programs on participants' subjective swallowing perceptions. Future studies can look at the effect of SPEAK OUT!® and SPEAK OUT!® Therapy Group programs on participants' swallowing and involuntary cough reflex based on objective clinical assessments such as the FEES or modified barium swallow study.

Depression

The current study also examined the possible impact of the SPEAK OUT!® Therapy Group program on lowering depression among participants with PD. Interestingly, both groups of participants self-reported relatively lower levels of depression at the end of the two years. The group means for depression reduced from 9.3 to 3.9 for the TX group and from 5.4 to 2.0 for the CN group. These findings contrast with a prior study in which the CN group demonstrated relatively higher depression

Table 3. Individual score summary of selected participants during the two-year period

	DRS-2 raw scores	DRS-2 total SS	Attention SS	I/P SS	Construction SS	Concept SS	Memory SS
PD 02							
Phase I	143	15	13	12	10	13	11
Phase II	141	13	12	10	7	14	13
Phase III	140	12	12	10	10	13	10
Phase IV	144	16	14	12	10	14	13
Phase V	143	15	14	12	10	14	11
PD 04							
Phase I	133	8	11	7	10	8	7
Phase II	142	13	11	13	10	12	10
Phase III	140	11	11	11	10	11	9
Phase IV	141	12	13	10	10	11	10
Phase V	139	10	13	11	10	10	7
PD 05							
Phase I	132	7	11	5	10	10	10
Phase II	136	9	11	6	5	13	13
Phase III	123	5	8	3	7	8	10
Phase IV	131	7	8	6	10	9	13
Phase V	128	6	8	6	5	10	10
PD 06							
Phase I	138	10	13	8	10	11	7
Phase II	142	13	11	11	10	12	10
Phase III	130	6	10	8	10	10	3
Phase IV	140	11	10	8	10	12	13
Phase V	139	10	10	10	10	10	13
CN 08							
Phase I	140	11	11	11	10	12	7
Phase II	140	11	10	10	10	12	10
Phase III	142	13	13	10	10	12	10
Phase IV	137	10	11	10	10	12	10
Phase V	139	10	11	8	7	12	10

SS, scaled score.

during six months [28]. The differences in depression scores between these two studies could be attributed to possible interindividual variations, differences in the backgrounds of the study participants, and differences in study methodology.

VRQOL

Finally, this study examined the impact of SPEAK OUT!® Therapy Group on the VRQOL of participants with PD. Similar to a prior study [32], the current study showed relatively better VRQOL scores among the TX participants. However, the TX and CN groups in the current study demonstrated im-

provements in the VRQOL scores between the baseline and the end of the two years. This also agrees with the two earlier studies [29,30]. It is important to note that the two prior studies had different designs, with no control group in Levitt et al. [29] and age-matched healthy controls in the other study [30]. Therefore, based on the available data, it cannot be concluded whether participation in the weekly SPEAK OUT!® Therapy Group program alone improved VRQOL for the TX group.

Overall, the current study provides evidence of a long-term positive impact of the SPEAK OUT!® Therapy Group on participants' cognitive scores and VRQOL scores. Four of the nine

original TX participants and one CN participant were available for all five phases of data collection. Their specific cognitive scores have been summarized in Table 3. However, these findings need to be interpreted with caution due to the small sample size. Additional studies with more heterogeneous and larger sample sizes can be helpful to further measure the long-term benefits of participation in the SPEAK OUT!® Therapy Group programs.

Study limitations

The current pilot study has several limitations. First, the two groups were rather small, with some control participants transitioning to the TX group over two years. Some of the control participants initially presented themselves to the outpatient clinic for physical therapy services. They agreed to participate in the current research project while they were receiving physical rehabilitation for their PD symptoms. Afterwards, many of these control participants requested speech therapy services secondary to their PD symptoms. Physician orders were obtained, and the control participants then transitioned to the TX group. Therefore, some of the participants in the CN group were not consistently in the same participant group during the 2-year period and this may have affected the overall group comparisons. All the participants were in the initial stages of PD, as indicated by their disease severity on the H-Y scale. Next, the current study encountered the loss of several participants (in both the TX and CN groups) due to medical reasons or unavailability during the data collection phases. These factors led to unequal sample sizes and a possible lack of clear treatment effects during the group comparisons. Further, the participants could not be randomly assigned to a TX or a CN group. Thus, additional large-scale studies can help identify SPEAK OUT!® Therapy Group programs' impact on the speech and cognitive domains of participants with PD with different severities and disease progression.

ACKNOWLEDGMENTS

The authors would like to acknowledge the time and interest of the participants with PD that made this study possible.

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