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Research Note

Be Clear: A New Intensive Speech Treatment for Adults With Nonprogressive Dysarthria

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Purpose: This article describes the effects of a new intensive dysarthria treatment program (*Be Clear*) on speech intelligibility in adults with dysarthria secondary to stroke and traumatic brain injury.
Method: A small group–repeated measures research design was used to examine the effects of treatment on the speech of 8 participants with nonprogressive dysarthria. Treatment consisted of a 1-hr prepractice session followed by 1-hr therapy sessions, 4 times per week, for 4 weeks (16 sessions). Paired-comparison ratings of speech intelligibility served as the primary outcome measure for the study. Perceptual data, quality of life, and communication partner opinion were obtained at 3 time intervals: (a) prior to treatment, (b) immediately posttreatment, and (c) 1–3 months posttreatment.
Results: Following treatment, group data demonstrated substantial improvements in speech intelligibility as perceived by naive listeners on a paired-comparison rating task. Word intelligibility was clinically significantly improved posttreatment and sentence intelligibility demonstrated statistically significant improvement. Communication partner ratings of speech intelligibility and overall communicative function were statistically significantly improved posttreatment.
Conclusions: The results of this study suggest that this new intensive treatment may have potential as an effective intervention for nonprogressive dysarthria. However, controlled studies are required to establish treatment efficacy.

Approximately 41.5% of individuals who have experienced a stroke (Lawrence et al., 2001) and 23%–65% of individuals who have experienced a traumatic brain injury (TBI; Yorkston, Honsinger, Mitsuda, & Hammen, 1989) will present with *dysarthria*. This motor speech disorder is characterized by slow, weak, imprecise, and uncoordinated movements of the speech musculature (Yorkston, 1996). All components of the speech mechanism may be affected differentially, leading to deviant perceptual speech features associated with respiration, phonation, articulation, resonance, and prosody (Duffy, 2013). The decreased speech intelligibility associated with dysarthria can cause difficulties with participation in everyday activities (Dykstra, Hakel, & Adams, 2007), resulting in psychosocial issues and significantly decreased quality of life (Dickson, Barbour, Brady, Clark, & Paton, 2008).

There are currently many treatment techniques used in the clinical setting to treat dysarthria. Therapy may focus on reducing the physiological impairment of a particular speech subsystem by increasing the strength and range of movement of the musculature (Robertson, 2001), implementing behavioral change such as decreasing speaking rate to improve intelligibility (Yorkston, Hakel, Beukelman, & Fager, 2007) or providing assistive devices to enhance communicative interactions (Duffy, 2013). To date, the effectiveness of these techniques in dysarthria management has not been rigorously investigated (Sellars, Hughes, & Langhorne, 2005), and there is debate amongst speech-language pathologists (SLPs) as to whether or not the techniques actually improve speech production (Clark, 2003). Therefore, there is a need for further research in this area to determine the most effective treatment protocols for dysarthria associated with nonprogressive neurological conditions.

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Clear Speech

One strategy that may prove useful in the treatment of nonprogressive dysarthria is clear speech. *Clear speech* refers to a speaking style where talkers spontaneously modify their habitual speech to enhance intelligibility for a listener. Rate reduction and purposeful enunciation (overarticulation) of all sounds are central elements in this technique, and long-term spectra of clear speech are 5–8 dB louder than that of conversational speech (Picheny, Durlach, & Braida, 1986). Talkers typically use clear speech when communicating in adverse conditions, such as when speaking in a noisy environment or when speaking with somebody who has a hearing loss. Studies in healthy talkers have found that speaking in an intentionally clear manner increases intelligibility by approximately 17–26 percentage points relative to habitual speech for hearing impaired listeners (Payton, Uchanski, & Braida, 1994; Picheny et al., 1986) and healthy listeners in noise (Payton et al., 1994).

A number of studies have been conducted with healthy adults to identify the acoustic changes responsible for the improved intelligibility associated with clear speech. The cumulative results have found that clear speech is characterized by a wide range of acoustic–phonetic adjustments including decreased speech rate, increased fundamental frequency and frequency range, increased pause frequency and duration, increased sound pressure level, vowel space expansion, increased consonant-to-vowel intensity ratios, decreased burst elimination, and decreased alveolar flapping (Bradlow, Kraus, & Hayes, 2003; Picheny et al., 1986). Based on these findings, it appears that clear speech may be a global variable that affects all levels of the speech mechanism including respiratory–phonatory drive, articulation, and prosody. As such, clear speech may have some clinical value in addressing the breakdowns in intelligibility experienced by adults with nonprogressive dysarthria.

Indeed, early research into the stimulability of dysarthric speakers for clear speech production has found that this technique results in similar acoustic changes to speech as those found in healthy individuals (Goberman & Elmer, 2005), resulting in increased speech intelligibility (Beukelman, Fager, Ullman, Hanson, & Logemann, 2002). However, as these studies were stimulability investigations, they determined if clear speech techniques improved speech intelligibility within a single assessment session only (i.e., without carryover to real-life communication contexts).

To date, there has been only one study that has used clear speech as a treatment technique for dysarthria. Ince and Rosenberg (1973) reported that general feedback on speech clarity (i.e., clear or unclear) was provided to two participants who were 7–9 months poststroke. After 36 half-hour treatment sessions, the two participants were able to produce speech without a single sentence being rated as unclear. The results of the study must be interpreted with caution, however, as the judgments were subjective and may have been biased by familiarity with the participants' speech as the sessions progressed.

Although the results of studies into clear speech seem promising, data on the use of clear speech in dysarthic speakers have been limited to single case and uncontrolled group studies (Beukelman et al., 2002; Ince & Rosenberg, 1973). In addition, there is a lack of research into the most effective way to implement clear speech as a potential therapy technique.

Treatment Design

Future research into the implementation of new dysarthria treatment protocols is likely to be driven by research in the fields of experience-dependent neuroplasticity and motor learning. For example, conventional treatment protocols for patients with dysarthria typically involve low intensity treatment. However, considerable research now exists to suggest that providing large amounts of practice over a shorter period of time can lead to superior speech and language outcomes for adults with neurogenic communication disorders compared to conventional treatment protocols (Bhogal, Teasell, & Speechley, 2003; Fox et al., 2006). As such, further research is required to determine whether current service delivery models for patients with dysarthria represent best practice.

Research into neuroplasticity also has indicated that changes in neural function are experience specific (Kleim & Jones, 2008). This finding is particularly significant for the management of nonprogressive dysarthria as it indicates that strength training using simple nonspeech oromotor exercises, a technique used frequently in the clinical setting (Mackenzie, Muir, & Allen, 2010), may not result in generalized improvements in speech function (Ludlow et al., 2008). Indeed, functional imaging studies in healthy human participants have found differences in the activation patterns for speech compared with nonspeech oromotor tasks, indicating that they have separate task-specific neural organizations (Bunton, 2008). Therefore, improvements in speech production may be best targeted through the practice of speech tasks.

Speech tasks utilized during treatment should involve meaningful communication to ensure that treatment is sufficiently salient, further promoting learning and plastic changes in the brain. This is a departure from traditional treatment, which often utilizes arbitrary treatment materials including dysarthria word lists and tongue twisters. Not only are these treatment materials not salient but also patients have reported they feel "ridiculous" or "daft" performing speech drills using generic treatment materials (Brady, Clark, Dickson, Paton, & Barbour, 2011). The use of such materials may have a significant impact on a person's motivation for therapy, and motivation and interest are key elements for successful learning (Schmidt & Lee, 2011).

As speech is a complex motor skill, the principles of motor learning (PMLs) should also be applied to dysarthria management in order to improve treatment efficacy and maximize patient outcomes. One PML that has received considerable attention in the research literature is that of *attentional focus*. Traditional dysarthria treatment often adopts an internal attentional focus, with the patient focusing on the kinetic, kinematic, and somatosensory aspects of speech production. For example, traditional articulation techniques such as phonetic placement therapy encourage patients to focus on the placement of their articulators (Duffy, 2013). This internal attentional focus is encouraged through the provision of knowledge of performance (KP) feedback (Schmidt & Lee, 2011), with clinicians giving specific feedback about performance errors (e.g., "You need to place your tongue up behind your front teeth to make that sound correctly"). Although such techniques are commonly observed in the clinical setting, there is now substantial evidence in the limb motor-learning literature that adopting an external attentional focus promotes movement automaticity and produces greater retention and transfer of learned skills than internal focus (Wulf, 2007). In speech therapy, this may mean drawing the patient's attention to the acoustic speech signal (Maas et al., 2008). To date, this strategy has been successfully used in programs such as Lee Silverman Voice Treatment (LSVT) LOUD, where adults with progressive dysarthria secondary to Parkinson's disease have been able to achieve substantial improvements in speech intelligibility by focusing externally on producing a loud speech signal (Fox, Morrison, Ramig, & Sapir, 2002).

In order to facilitate this external attentional focus it may also be beneficial to decrease the amount of specific KP feedback provided during sessions, instead providing simple knowledge of results (KR) feedback on the correctness of the response. Indeed, providing KR feedback has been found to result in superior outcomes for healthy adults learning novel speech tasks (Ballard et al., 2012).

Research in PML has also found that the way in which treatment tasks are scheduled within a practice session can have a significant impact on the acquisition and retention of trained motor skills. Traditional dysarthria therapy typically schedules drill treatment tasks in a blocked fashion. Although blocked practice improves performance during skill acquisition, evidence suggests that retention and transfer of trained skills is superior when practiced under a random practice schedule (Maas et al., 2008). However, it should be noted that the benefits of random practice have largely been derived from studies utilizing simple laboratory tasks, with increased task complexity appearing to reduce the benefits of random practice (Merbah & Meulemans, 2011). It is thought that random practice schedules engage learners in more effortful cognitive processing than blocked practice schedules (Lee & Magill, 1983; Shea & Zimny, 1983). Therefore, complex tasks, which are already cognitively demanding (Albaret & Thon, 1999), may become too difficult when practiced in a random order. As such, it has been suggested that training complex tasks (e.g., speech) using novel practice schedules that combine aspects of both blocked and random practice may lead to superior retention and transfer of trained skills (Landin & Hebert, 1997).

On the basis of this research, there is a need to develop treatment protocols that involve intensive and specific practice of meaningful speech production tasks. In addition, new treatment protocols may benefit from including aspects of random practice in the practice schedules to ensure that improvements in speech production transfer to novel situations outside of the clinical setting and are sustainable. Last, therapy should encourage the patient to adopt a strategy of external attentional focus, with speakers monitoring their acoustic speech signal not just during treatment but also during everyday communication settings (Maas et al., 2008).

Aims of the Present Study

In an effort to improve treatment outcomes for adults with nonprogressive dysarthria, a new speech treatment (*Be Clear*) based on the principles of neuroplasticity and motor learning has been developed. This novel, intensive treatment program focuses on clear speech as a means of improving speech intelligibility in nonprogressive dysarthria. The present investigation is a Phase II feasibility study (Robey, 2004) into the effects of the *Be Clear* program, and is the first step in a program of research focused on the development and evaluation of a treatment for dysarthria associated with nonprogressive neurological conditions.

As a Phase II feasibility trial, the purpose of the present investigation is to characterize intervention effects on the speech of adults with nonprogressive dysarthria, determine whether or not all the treatment activities can be completed in the allotted time, and ascertain whether participants can tolerate the intensive treatment schedule. If the *Be Clear* program is found to have a positive effect on speech intelligibility, further investigation of the program's efficacy through more rigorous experimental trials may be warranted.

Therefore, the primary aim of the present study is to determine whether or not the *Be Clear* program would have a positive effect on speech intelligibility in adults with nonprogressive dysarthria. As a feasibility study, the secondary aim of this investigation is to refine the tasks and materials implemented during the *Be Clear* program and determine whether or not the intensive treatment schedule is viable and acceptable to people with chronic dysarthria, irrespective of etiology, severity, or dysarthria type.

Method

Participants

Ethical clearance for this project was granted by the Metro South Hospital and Health Service District Human Research Ethics Committee and by the Behavioural and Social Sciences Ethical Review Committee at the University of Queensland. Written informed consent was obtained from each participant and their primary communication partner prior to commencing the study.

Participants were recruited retrospectively and prospectively from the brain injury rehabilitation unit of a major metropolitan hospital in Brisbane as well as from a specialist community-based rehabilitation service for people with acquired brain injury. Participants comprised a convenience sample, with clinicians and caseworkers at these sites identifying current and discharged patients who may be eligible to take part in the study and inviting them to participate. Participants were included in the study if they presented with dysarthria as diagnosed by a SLP; were at least 6 months postonset of brain impairment; were able to speak and understand English; were judged by the referring clinician to have adequate cognition to participate in therapy; and were stimulable for clear speech during pretreatment assessment. Potential participants were excluded if, in addition to their dysarthria, they presented with aphasia, significant hearing or vision loss, dementia, apraxia of speech, or posttraumatic amnesia.

The presence of dysarthria was confirmed by an SLP highly experienced in the assessment and management of dysarthria. The diagnosis of dysarthria type was based on available medical information, perceptual judgement of speech samples, and an oromotor assessment. The rating of dysarthria severity was based on an informal assessment of speech intelligibility made during conversational speech. Severity level was scored on a 7-point scale ranging from 0 (*normal speech*: no impairment, speech completely intelligible) to 6 (*severe impairment*: speech completely unintelligible).

In total, eight individuals (five men, three women) with persistent dysarthria resulting from a medically documented nonprogressive neurological condition (six TBI, two stroke) were recruited. Participants had a mean age of 35 years (range = 18–51 years, *SD* = 12 years) with a mean time postonset of 26 months (range = 10–78 months, *SD* = 22 months). The broad age range of the participants generally reflected the younger age demographic of the TBI population (Myburgh et al., 2008) with five of the six TBI cases ranging in age from 18 to 39 years. The remaining TBI case was older at 51 years. In contrast, the age of the two participants (43 and 50 years) who had suffered a stroke was lower than the usual age of stroke victims (Feigin, Lawes, Bennett, & Anderson, 2003). However, all participants were recruited from a hospital rehabilitation caseload, thereby reflecting the demographics of the patients in this facility.

Dysarthria severity within the group ranged from mild to severe impairment. Seven of the participants were documented as having some form of cognitive impairment (e.g., memory deficits exhibited during working memory tasks) as a result of their etiology. Because participants were recruited retrospectively from a clinical setting, all participants had received speech therapy targeting their dysarthria prior to inclusion in the study. Details of each participant can be found in Table 1.

Procedure

The participants underwent a series of assessments at three time intervals: prior to treatment, immediately posttreatment, and 1–3 months posttreatment (i.e., follow-up [FU]), depending on the participants availability (average = 2.25 months). Perceptual assessments related to speech intelligibility were conducted twice during each assessment phase to account for the effects of day-to-day variability in speech production. Everyday communication outcome measures were obtained once during each of the three assessment phases. All assessment sessions were performed by research SLPs not directly involved in the delivery of the speech treatment. The participants' speech during all assessment tasks was recorded onto a Korg MR-1 audio recorder (Korg Inc., Tokyo, Japan) via a headset microphone (AKG miniature condenser-model C520, AKG Acoustics GmbH, Vienna, Austria) positioned at a mouth-to-microphone distance of 5 cm for each testing session. Speech samples were recorded as wave files at a sampling rate of 48 kHz with 24-bit quantization.

Perceptual Assessment and Analysis

Because the primary aim of the study is to determine whether the new *Be Clear* program would lead to improvements in speech intelligibility, paired comparison ratings of intelligibility were selected as the primary outcome measure. These ratings were performed by naive listeners in order to enhance the ecological validity of the study. Comparisons were based on a short conversational speech sample (approximately 2 min) on a topic of the participant's choice in their normal speaking voice. From this sample a section of 30–40 s was selected within which the participant was the main contributor. Any comments made by the assessor within these selections were removed prior to presentation. The sample from the first assessment session in each assessment phase was used for analysis, consistent with previous studies that have used the paired-comparisons technique with speakers with dysarthria (Wenke, Theodoros, & Cornwell, 2011).

The conversational speech samples were rated by four speech-language pathology students (three women, one man) who were in enrolled in the first semester of a master's program. The students had not had any previous exposure to dysarthric speech, nor had they completed any clinical placements as part of their program. Listeners were sufficiently proficient in English to complete postgraduate studies at an Australian university. Although hearing acuity was not formally assessed, all listeners reported normal hearing.

The speech samples were randomly presented to listeners in several different combinations including (a) pretreatment–posttreatment, (b) pretreatment–FU, (c) posttreatment–pretreatment, and (d) FU–pretreatment. The listeners' task was to indicate whether the first or the second sample of each pair was easier to understand, or whether there was no discernible difference. Listeners were blinded to the assessment interval (i.e., pretreatment, posttreatment, FU). Prior to completing the task, the listeners were provided with the following instructions,

Table 1. Participant characteristics.

Participant	Sex	Age	Etiology	Dysarthria severity level[a]	Primary dysarthria type	Time postonset[a]	Cognitive impairments
1	M	32	TBI-MVA	Mild–Moderate	Flaccid-ataxic	78 months	Divided attention, memory
2	F	43	CVA	Severe	Flaccid-ataxic	30 months	Memory
3	M	26	Penetrating TBI	Mild–Moderate	Ataxic	13 months	Verbal fluency, visual memory, visuo-spatial memory
4	F	39	TBI-MVA	Mild–Moderate	Ataxic	36 months	Processing speed, complex planning and problem solving, divided attention
5	M	22	TBI	Mild–Moderate	Ataxic	22 months	Processing speed, memory, divided attention, planning
6	M	18	TBI-MVA	Moderate–Severe	Spastic-ataxic	10 months	Verbal concepts, mental control, recall
7	F	50	CVA	Mild–Moderate	Hypokinetic	10 months	WNL
8	M	51	TBI-MVA	Mild–Moderate	Spastic	12 months	Memory, attention, planning, organization

Note. M = male; TBI = traumatic brain injury; MVA = motor vehicle accident; F = female; CVA = cerebrovascular accident (stroke); WNL = within normal limits.

[a]Indicates the commencement of the *Be Clear* program.

adapted from previous studies (Sapir et al., 2003; Wenke et al., 2011):

> You are going to hear pairs of audio speech samples. You will be deciding which speech sample, the first or the second, is clearer or easier to understand. On your paper you will write the letter *A* if you think the first sample is easier to understand or the letter *B* if you think the second sample is easier to understand. If you do not think there is any difference in how easy it is to understand the two samples, write the word *same*.
>
> You are only ever comparing two speech samples with each other. Do not compare one speech sample to any previous or future speech samples that you hear. You should listen to each pair of speech samples using a "fresh" ear.

To ensure listeners understood the task requirements, we provided training and practice items before performing the actual ratings. As each pair of pre-/postspeech samples was rated twice by each of the four naive listeners, a total of 64 paired comparison ratings were included in the final analysis. A total of 64 ratings comparing the pre-treatment and follow-up speech samples were also included in the analysis.

The speech intelligibility of each participant also was formally evaluated using the Assessment of Intelligibility of Dysarthric Speech (ASSIDS; Yorkston, Beukelman, & Traynor, 1984). Participants were required to read or repeat after the examiner 50 single words and 22 sentences randomly chosen from stimuli provided in the ASSIDS manual. The recorded samples were then numerically coded and randomly presented to two independent and blinded research personnel who transcribed each utterance and recorded the duration of each of the 22 sentences in seconds and milliseconds using a stopwatch. This information was used to calculate the mean value for percentage word intelligibility, percentage sentence intelligibility, words per minute (WPM), and the communication efficiency ratio (CER) for each participant. For the purpose of statistical analysis, the data obtained from the two raters was averaged to give a single (mean) value for each parameter at each assessment phase (i.e., mean pretreatment, mean posttreatment, mean 3-month FU). As interrater, intrarater, and test–retest reliability of the ASSIDS in adults with dysarthria has already been established (Yorkston et al., 1984), reliability of these measures was not investigated in the present study.

Everyday Communication Measures

Each participant completed the Dysarthria Impact Profile (DIP; Walshe, Peach, & Miller, 2009), a questionnaire designed to investigate the psychosocial impact of dysarthria from the perspective of the speaker. The DIP comprises a total of 48 statements divided into five sections —Section A: The effect of dysarthria on me as a person; Section B: Accepting my dysarthria; Section C: How I feel others react to my speech; Section D: How dysarthria affects my communication with others; and Section E: Dysarthria relative to other worries and concerns. Participants are required to rate each statement on a 5-point scale from 1 = *strongly agree* to 5 = *strongly disagree*. These responses are given a weighted score (i.e., positively worded statements to which the respondent *strongly agrees* receive a score of 5 and *strongly disagree* statements receive a score of 1). In negatively worded statements, the reverse was true with *strongly disagree* statements receiving a score of 5 (Walshe et al., 2009). These scores were used to calculate a mean score per statement for each section as well as a Total Impact Score. Lower scores on this assessment are associated with greater negative impact.

Each participant's primary communication partner was asked to rate five different aspects of the participant's everyday communication abilities on a scale of 1 to 7. A rating of 7 was indicative of a *very good ability*, whereas a rating of 1 indicated that the participant demonstrated a *poor ability* for the chosen item of communication.

Questions included: (a) How easy is it to understand the speaker; (b) How often do you ask the speaker to repeat themselves; (c) How often does the speaker initiate conversation with you; (d) How often does the speaker initiate conversation with an unfamiliar person; and (e) Overall, how would you rate the speaker's speech and voice? The communication partner was also given the opportunity to provide additional comments regarding the participant's communication and/or the treatment (Wenke et al., 2011).

Treatment

After the initial assessment sessions, participants completed the intensive speech treatment (*Be Clear* program), which comprised two main phases—a prepractice phase and an intensive practice phase, as shown in Table 2. All treatment sessions were delivered by the first author in an individual face-to-face format. With the exception of Participant 3 who received four home visits due to transportation restrictions, all participants received treatment in a health care setting (e.g., SLP's clinic room). Participant attendance at treatment sessions was recorded, and instances of failed or reduced attendance were documented. Treatment stimuli were presented on a computer screen via a PowerPoint presentation. Homework was also saved as a PowerPoint presentation and provided to the participants on a USB stick.

Prepractice Phase

Prepractice prepares the participants for more intensive practice sessions by ensuring that they have an adequate understanding of the task to be completed, including what constitutes a "correct" response (Schmidt & Lee, 2011). It also provides an opportunity to shape the participants' speech production attempts and elicit a small number of correct responses prior to practice. For the present study, the 1-hr prepractice session aimed to establish the participants' understanding of the concept of clear speech and instate clear speech production. To achieve this, participants watched videos of healthy adults reading aloud a standard passage using both their normal speech and clear speech. For each video, participants were required to identify which of the speech samples was clearest and then discuss the changes made by the speaker (e.g., exaggerated articulation) that may have contributed to the observed improvements in speech clarity. Participants then read aloud the same standard passage while imitating the clear speech they had observed in the videos. The clinician also provided specific KP feedback on the participants' speaking technique (e.g., "Use big speech movements," "Slow down") during this session in order to shape their speech production into clear speech.

Intensive Practice Phase

This phase followed the initial prepractice phase and consisted of 1-hr therapy sessions, four times a week, for a 1-month period (16 sessions in total). The treatment schedule was consistent with the LSVT LOUD program with respect to schedule, intensity, and homework (Fox et al., 2002). Consistent with previous motor speech treatment studies using the PMLs (Ballard, Maas, & Robin, 2007; Ballard et al., 2012; Knock, Ballard, Robin, & Schmidt, 2000), each treatment session in the intensive practice phase included a brief prepractice component and the intensive practice component. During the short prepractice component, participants attempted to produce a small selection of stimuli randomly selected from the practice materials for that session. The clinician provided modeling and KP feedback where necessary in order to shape the participants' speech productions. Once participants were able to produce stimuli of adequate clarity, as judged by the treating clinician, without any further prompting they moved into the intensive practice component of the session.

The first half of each intensive practice component was dedicated to structured speech drills. These drills included five repetitions of 10 everyday functional phrases and five repetitions of 10 service requests using clear speech. The stimulus phrases were developed by the participants during their first session and remained constant for the duration of the program. Increasing the number of repetitions of a task further increases the intensity of treatment, and has been shown to be vital in instating neural reorganization and maintaining behavioral improvements following the cessation of treatment (Kleim & Jones, 2008). Therefore, a high level of repetition both within and across treatment sessions was built into the program to enhance learning. The second half of the practice component targeted functional speech tasks including reading, picture description, and conversation, using a random practice schedule. To be specific, functional speech tasks were presented in a random order with participants allowed three attempts to accurately produce a given treatment item before moving on to the next randomly selected task. According to the motor learning literature, small blocks of trials (e.g., three trials) in a random order may result in superior retention and transfer of trained skills than either traditional blocked or random practice schedules (Landin & Hebert, 1997).

Across each intensive practice session, treatment stimuli were created by the SLP on the basis of each participant's unique interests and functional needs. The specific practice of meaningful speech production tasks ensured adherence to the principles of specificity and saliency, potentially enhancing the effects of treatment on neuroplasticity. Treatment stimuli for the reading, picture, and conversational speech tasks changed every session to maintain participant interest and motivation. For participants with significantly decreased speech rate, treatment materials in the second half of the session were modified to increase the number of trials completed per sessions (e.g., reading tasks were limited to one or two short sentences; the number of turns per conversation was reduced).

While performing all speech tasks, participants were encouraged to focus on their acoustic speech signal, ensuring it was as clear as possible. It was intended that this

Table 2. Outline of *Be Clear* treatment protocol.

Phase	Components	Tasks	Time	Motor learning principles	Neuroplasticity principles
1. Prepractice	Extended Prepractice	Shaping and instatement of clear speech concepts: • Understanding of task requirements • Shaping the speech production attempts to clear speech targets • Eliciting a small number of correct responses as a precursor for entry into Phase 2	60 min at the outset of the *Be Clear* Program	Prepractice phase common in programs based on motor learning principles, KP feedback, and modeling by clinician	
2. Intensive	Prepractice	Stimuli randomly selected from practice materials for that day	~10 min	KP feedback (e.g., “Use big speech movements”) and modeling	
	Practice	1. Functional phrases 10 phrases, 5 repetitions (e.g., “Did anyone feed the dogs?”; “What do we have on tomorrow?”)	~10 min	Blocked practice schedule KR feedback (e.g., *clear* or *unclear*) External attentional focus on speech signal	Specificity Saliency Repetition
		2. Service requests 10 service requests, 5 repetitions (e.g., “Where is the _____?”; “How much is _____?”)	~10 min	Blocked practice schedule KR feedback (e.g., *clear* or *unclear*) External attentional focus on speech signal	Specificity Saliency Repetition
		3. Functional speech tasks Alternate between reading, picture description, and conversational speech tasks. Give three attempts to produce a stimulus item correctly before moving onto the next item	30 min: ~2–3 min per stimulus item	Random practice schedule KR feedback (e.g., *clear* or *unclear*) External attentional focus on speech signal	Specificity Saliency Repetition
		4. Homework tasks Functional phrases, service requests, and functional speech tasks Transfer tasks (e.g., phone calls)	~15 min		Intensity Repetition Saliency

strategy of external attentional focus would improve the generalization of clear speech to communication situations outside of the clinical setting. To further promote the development of participants' self-evaluation skills and self-efficacy, the participants' speech attempts were recorded using a digital audio recorder. These speech samples were played back to the participant intermittently. Participants then rated the speech clarity of the recorded samples on a 10-point scale (1 = *completely unclear speech*; 10 = *clear speech*). During the practice phase of each session, the clinician provided general KR feedback on speech clarity, labeling speech attempts as either *clear* or *unclear*. As previously stated, providing simple feedback on the correctness of the response may enhance the retention and transfer of speech skills as well as promoting an external attentional focus.

The final part of the intensive practice phase involved daily home practice of approximately 15 min during which participants practiced their functional phrases, service requests, and functional speech tasks. In addition, participants completed carry-over tasks designed to promote the transfer of their clear speech to everyday situations (e.g., talking on the phone, ordering a coffee at a cafe, requesting information about items in a shop). Following the completion of the *Be Clear* program, participants were required to continue to practice activities that were taught during therapy at home for 10 min a day, 3–5 days until their follow-up assessment sessions were conducted.

Statistical Analysis

Due to the small sample size, both interval data (e.g., ASSIDS) and ordinal data (e.g., DIP, communication partner questionnaires) were analyzed using nonparametric procedures. All statistical analysis was performed on IBM SPSS Statistics (Version 22, IBM Corp, Armonk, NY). Friedman's two-way analysis of ranks was used to determine whether treatment had a significant effect on both perceptual and psychosocial outcome measures, with the exception of the paired comparison ratings, across time (i.e., pre-/posttherapy). Where a significant ($p < .05$) effect for time was found, Wilcoxon signed-ranks tests were performed to determine whether the significant effect occurred between pre- and posttreatment or pretreatment and FU samples. In addition, changes to percentage word intelligibility and percentage sentence intelligibility on the ASSIDS were compared to previously established criteria to identify clinically significant change. Any improvement above 3.2% for word intelligibility and 8.6% for sentence intelligibility was considered to be a clinically significant change (Yorkston et al., 1984). Results of the paired comparison ratings were analysed descriptively.

Results

In this study we were primarily interested in group performance (see Tables 3, 4, and 5). Individual data has been provided in Tables 6, 7, 8, and 9 to provide the reader with additional information with respect to etiology.

Attendance

All eight participants recruited to the study completed the *Be Clear* program as prescribed. Participants attended 100% of their allocated treatment sessions with no changes to the treatment schedule required throughout the study.

Perceptual Analyses

Results of the paired comparison ratings indicated that of the 64 ratings made comparing the pretreatment and posttreatment samples, the posttreatment sample was rated as being easier to understand in 72% of cases (Pre: *Better* = 11%; *Same* = 17%). At follow-up, 64% of the FU speech samples were rated as being easier to understand in comparison to pretreatment speech samples (Pre: *Better* = 19%; *Same* = 17%).

Outcomes of the ASSIDS are presented in Table 3. Due to failure of the recording equipment, P5 only had one pretreatment sample available for analysis, P2 only had one posttreatment sample available for analysis, and P4 only had one FU sample available for analysis. The results of the Friedman test indicated that there was a statistically significant difference in percentage sentence intelligibility ($\chi^2 = 9.750$, $p = .008$) and WPM ($\chi^2 = 7.750$, $p = .021$) across the three time points for the group. Further analysis revealed a statistically significant increase in percentage sentence intelligibility immediately posttreatment ($p = .017$), with participants maintaining this significant improvement at follow-up ($p = .012$). For WPM, post hoc analysis revealed a statistically significant decrease in speech rate both immediately posttreatment ($p = .017$) and at follow-up ($p = .036$).

Though not statistically significant, percentage word intelligibility increased by an average of 5.81% immediately posttreatment, meeting the criterion for a clinically significant improvement (Yorkston et al., 1984). This clinically significant increase was maintained at follow-up. In contrast, sentence intelligibility increased on average by 8.36%, which although statistically significant, was just under the clinically significant criterion of 8.6%. No significant statistical or clinical changes were noted for CER.

Everyday Communication Measures

Results of the DIP are displayed in Table 4. Statistical analyses revealed no statistically significant changes across time for any of the five subsections (i.e., Sections A through E) across the three assessment phases. No statistically significant changes were found for the Total Impact Score across time ($\chi^2 = 5.097$, $p = .078$).

Outcomes of the communication partner questionnaire are displayed in Table 5. A main effect for time was identified for two of the five items in the questionnaire, including the ability to understand the participant ($\chi^2 = 6.706$, $p = .035$) and the overall rating of speech quality ($\chi^2 = 9.100$,

Table 3. Results for the Assessment of Intelligibility of Dysarthric Speech (ASSIDS).

Task	Pre *M* (*SD*)	Post *M* (*SD*)	FU *M* (*SD*)	Time main effect χ^2	Time main effect *p*	Post hoc contrasts Pre–Post *p*	Post hoc contrasts Pre–FU *p*
% Word intelligibility	75.13 (24.90)	80.94 (21.79)[a]	83.06 (23.68)[a]	1.867	.393	*ns*	*ns*
% Sentence intelligibility	86.55 (16.39)	94.91 (7.31)	93.54 (11.03)	9.750	.008*	.017*	.012*
WPM	136.65 (50.40)	108.49 (46.96)	119.15 (44.40)	7.750	.021*	.017*	.036*
CER	0.65 (0.30)	0.55 (0.25)	0.60 (0.25)	1.750	.417	*ns*	*ns*

Note. Pre = pretreatment; Post = posttreatment; FU = follow-up; *ns* = not statistically significant; WPM = words per minute; CER = communication efficiency ratio.

[a]Indicates a clinically significant change of 3.2% for word intelligibility.

*$p < .05$.

$p = .011$). Further analysis revealed that communication partners reported a significantly improved ability to understand the participant immediately posttreatment ($p = .023$). Improvements in overall ratings of speech were also noted both after treatment ($p = .011$) and at follow-up ($p = .038$). No statistically significant changes were found for the remaining three items on the questionnaire.

Discussion

In this study, we investigated the feasibility of the *Be Clear* program, an intensive treatment aimed at improving speech intelligibility in nonprogressive dysarthria. The participants in this study demonstrated short- and long-term improvements on both perceptual ratings of speech intelligibility and everyday communication measures following treatment.

Results of the paired comparison ratings indicated that naive listeners detected improvements in conversational speech intelligibility following treatment with the *Be Clear* program. Although the majority of posttreatment speech samples were rated as being easier to understand in comparison to pretreatment samples, improvements in intelligibility were maintained to a lesser extent at follow-up. Individual analysis of participant results revealed that both stroke and TBI participants demonstrated substantial improvements on this outcome measure posttreatment, suggesting that participants' conversational speech intelligibility improved regardless of etiology. As listeners had no prior experience listening to dysarthric speech, they could be considered representative of people with whom dysarthric speakers are likely to interact during their everyday activities. Therefore, it is reasonable to conclude that the improvements in intelligibility that occurred following treatment would be easily perceived by members of the community.

Participants demonstrated clinically significant improvements in speech intelligibility at the single word level, as measured on the ASSIDS. This improvement failed to reach statistical significance, most likely due to the high variability within the group. On the other hand, although participants' achieved statistically significant improvements on sentence intelligibility immediately posttreatment and at follow-up, these improvements were not found to be clinically significant (i.e., >8.6% change). The lack of clinically significant change to sentence intelligibility following treatment may be due to the fact that many participants scored highly on this task prior to treatment. Of the eight participants recruited to the study, five of the TBI participants and one of the stroke participants were rated as having mild–moderate speech impairments. Individual analysis revealed that these six participants all had sentence intelligibility levels over 90% prior to treatment, leaving little room for improvement on this outcome measure. Indeed, it has been suggested that ongoing recovery for individuals with

Table 4. Results of the Dysarthria Impact Profile.

Task	Pre *M* (*SD*)	Post *M* (*SD*)	FU *M* (*SD*)	Time main effect χ^2	Time main effect *p*
Section A	2.77 (0.77)	3.32 (0.96)	3.15 (1.04)	2.000	.368
Section B	3.10 (0.80)	3.68 (0.69)	3.57 (0.68)	5.600	.061
Section C	3.18 (0.50)	3.32 (0.60)	3.39 (0.69)	2.000	.368
Section D	2.95 (0.62)	3.57 (0.76)	3.38 (0.66)	5.250	.072
Section E	2.63 (1.51)	3.13 (1.46)	3.38 (1.69)	1.600	.449
TIS	144.75 (30.32)	166.63 (37.37)	164.88 (35.62)	5.097	.078

Note. Scores for Section A through E represent the mean score per statement; lower scores are associated with greater negative impact. Pre = pretreatment; Post = posttreatment; FU = follow-up; Section A = The effect of dysarthria on me as a person; Section B = Accepting my dysarthria; Section C = How I feel others react to my speech; Section D = How dysarthria affects my communication with others; Section E = Dysarthria relative to other worries and concerns; TIS = total impact score.

Table 5. Results of communication partner questionnaire.

Question	Pre	Post	FU	Time main effect		Post hoc contrasts	
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	χ^2	*p*	Pre–Post *p*	Pre–FU *p*
1. How easy is it to understand speaker	3.86 (0.690)	4.86 (0.900)	4.43 (0.535)	6.706	.035*	.023*	.157
2. Request for repetition	3.86 (0.690)	4.14 (0.900)	4.214 (0.393)	1.412	.494	*ns*	*ns*
3. Conversation initiation with familiar speakers	5.71 (1.380)	5.86 (1.464)	6.14 (1.464)	3.500	.174	*ns*	*ns*
4. Conversation initiation with strangers	3.71 (1.254)	4.00 (0.577)	4.29 (1.380)	2.000	.368	*ns*	*ns*
5. Overall rating of communication	2.86 (0.900)	3.71 (0.951)	3.86 (0.690)	9.100	.011*	.011*	.038*

Note. Higher values indicate better performance; *ns* = not statistically significant. Pre = pretreatment; Post = posttreatment; FU = follow-up. *$p < .05$.

mild dysarthria may not be signaled by further improvements in intelligibility on this assessment (Yorkston et al., 1984). It is important to note that P2 (stroke) and P6 (TBI), who were rated as having the most severe speech impairments prior to commencing the study, both made clinically significant improvements on sentence intelligibility following treatment. Immediately posttreatment, P2's sentence intelligibility score increased by 25.80% and P6's score increased by 23.07%. Further, both of these participants maintained clinically significant improvements on this measure at follow-up.

Participants exhibited a significant decrease in speech rate immediately following treatment and at follow-up. This finding is consistent with the research literature with decreased rate being one of the most commonly reported features of clear speech production. The decreased speech rate associated with clear speech has been attributed to reduced articulation rates, increased pause frequency and duration, and increased duration of individual speech sounds including plosives, fricatives, nasals, and vowels (Bradlow et al., 2003; Ferguson & Kewley-Port, 2007; Picheny et al., 1986). Although Krause and Braida (2004) found that healthy speakers can be trained to produce clear speech at normal speaking rates, improvements in intelligibility were not as great as those observed in clear speech produced at a typically slower rate. This evidence suggests that the temporal adjustments traditionally noted in clear speech may contribute, at least in part, to the improved speech intelligibility associated with this speaking technique. Treatment targeting rate control is frequently utilized to improve speech intelligibility in adults with nonprogressive dysarthria. Although individuals with dysarthria often speak more slowly than their healthy peers, their speech rates may still be excessively fast given the physiologic limitations imposed on their speech mechanisms (Blanchet & Snyder, 2010). Indeed, several participants in the present study demonstrated slow speech rates prior to treatment. For such individuals, compensatory techniques targeting further reductions in speech rate may prove beneficial as they can facilitate improved range of movement and articulation accuracy, allow additional time for coordination, and improve linguistic phrasing (Blanchet & Snyder, 2009, 2010). As such, the observed decrease in WPM in the present study may have contributed to improvements

Table 6. Individual participant results for the paired comparison ratings of speech intelligibility.

Participant	Condition	*N*	Pre better (%)	Post better (%)	FU better (%)	Same (%)
TBI						
1	Pre vs. post	8	4 (50.0)	0	NA	4 (50.0)
	Pre vs. FU	8	5 (62.5)	NA	1 (12.5)	2 (25.0)
3	Pre vs. post	8	0	8 (100.0)	NA	0
	Pre vs. FU	8	1 (12.5)	NA	6 (75.0)	1 (12.5)
4	Pre vs. post	8	2 (25.0)	5 (62.5)	NA	1 (12.5)
	Pre vs. FU	8	2 (25.0)	NA	3 (37.5)	3 (37.5)
5	Pre vs. post	8	0	7 (87.5)	NA	1 (12.5)
	Pre vs. FU	8	0	NA	7 (87.5)	1 (12.5)
6	Pre vs. post	8	0	7 (87.5)	NA	1 (12.5)
	Pre vs. FU	8	0	NA	7 (87.5)	1 (12.5)
8	Pre vs. post	8	0	8 (100.0)	NA	0
	Pre vs. FU	8	0	NA	8 (100.0)	0
Stroke						
2	Pre vs. post	8	0	5 (62.5)	NA	3 (37.5)
	Pre vs. FU	8	4 (50.0)	NA	4 (50.0)	0
7	Pre vs. post	8	1 (12.5)	6 (75.0)	NA	1 (12.5)
	Pre vs. FU	8	0	NA	5 (62.5)	3 (37.5)

Note. TBI = traumatic brain injury; Pre = pretreatment; Post = posttreatment; NA = not applicable; FU = follow-up.

Table 7. Individual participant results for the ASSIDS.

Participant	Task	Pre	Post	FU
TBI				
1	% Word intelligibility	95.00	91.00	94.00
	% Sentence intelligibility	95.23	98.98	98.41
	WPM	158.23	127.81	128.39
3	% Word intelligibility	93.50	92.50	92.50
	% Sentence intelligibility	97.05	99.66	98.41
	WPM	176.27	105.39	123.93
4	% Word intelligibility	69.50	79.00[a]	84.00[a]
	% Sentence intelligibility	90.81	95.45	95.23
	WPM	163.94	167.08	164.23
5	% Word intelligibility	88.00	95.00[a]	99.00[a]
	% Sentence intelligibility	95.91	95.34	98.64
	WPM	168.59	164.54	168.89
6	% Word intelligibility	51.50	81.00[a]	71.50[a]
	% Sentence intelligibility	71.59	94.66[b]	93.41[b]
	WPM	63.74	49.70	60.72
8	% Word intelligibility	80.50	86.58[a]	98.50[a]
	% Sentence intelligibility	96.93	98.98	99.66
	WPM	103.52	75.58	85.24
Stroke				
2	% Word intelligibility	26.50	29.00	29.00
	% Sentence intelligibility	51.7	77.5[b]	66.7[b]
	WPM	68.36	49.06	63.52
7	% Word intelligibility	96.5	93.5	96
	% Sentence intelligibility	93.18	98.75	97.84
	WPM	190.48	128.72	158.26

Note. Pre = pretreatment; Post = posttreatment; FU = follow-up; TBI = traumatic brain injury; WPM = words per minute.

[a]Indicates a clinically significant change of 3.2% for word intelligibility.
[b]Indicates a clinically significant change of 8.6% for sentence intelligibility.

in sentence intelligibility noted on the ASSIDS, and those perceived by listeners during the paired-comparison rating task.

Improvements in intelligibility were also reflected in the results of the communication partner questionnaire. Participants showed a significant improvement in their ability to be understood by communication partners immediately following treatment. This finding suggests that

Table 8. Individual Total Impact Scores for the DIP.

Participant	Pre	Post	FU
TBI			
1	161	156	153
3	118	121	126
4	169	195	220
5	186	208	172
6	155	204	179
8	144	177	175
Stroke			
2	89	107	107
7	138	165	187

Note. Lower scores are associated with greater negative impact. Pre = pretreatment; Post = posttreatment; FU = follow-up; TBI = traumatic brain injury.

Table 9. Individual overall ratings of communication (Item 5) from the communication partner questionnaire.

Participant	Pre	Post	FU
TBI			
1	4	6	—
3	4	5	4
4	3	3	3
5	3	4	4
6	2	3	4
8	2	3	4
Stroke			
2	2	3	3
7	4	5	5

Note. Higher scores indicate better performance. Pre = pretreatment; Post = posttreatment; FU = follow-up; TBI = traumatic brain injury; em dash indicates data not obtained.

participants were able to generalize their clear speech to communication situations outside of the clinical setting. Improvements in overall communication ability were also reported immediately posttreatment and at follow-up. The improvements in intelligibility noted in the present study were consistent with previous findings that clear speech can lead to improved speech intelligibility in adults with dysarthria secondary to stroke and TBI (Beukelman et al., 2002; Ince & Rosenberg, 1973). The current study lends further support for the use of clear speech as an approach for improving speech production in adults with non-progressive dysarthria.

Despite improvements in speech intelligibility, participants failed to show any improvement initiating conversations with unfamiliar people. It may be that environmental barriers experienced by participants resulted in limited opportunities for communication partners to observe participants speaking with strangers. On the other hand, a lack of improvement on this outcome measure may also be attributed to other deficits inherent in TBI including reduced attention, initiation, and affect. Participants also did not make any significant improvements in their ability to initiate conversation with familiar communication partners posttreatment. High scores on this item of communication prior to treatment may indicate that, despite their speech difficulties, participants were already comfortable initiating conversations with close family members and friends. As a result, there was minimal scope for improvement on this item. Other studies investigating the impact of intensive treatment protocols on everyday communication outcomes in dysarthric speakers have reported similar results, with participants scoring highly on their ability to initiate conversations with familiar communication partners prior to treatment (Wenke et al., 2011).

The lack of significant change in repetition request scores on the communication partner questionnaire was unexpected. It was thought that the increased speech intelligibility reported by communication partners on this outcome measure would have resulted in fewer communication breakdowns, thus decreasing the number of repetitions requested posttreatment. This hypothesis is supported by anecdotal evidence, with many participants reporting a substantial decrease in the frequency with which family members and friends asked them to repeat themselves posttreatment. It may be that, due to the intensive nature of the program, communication partners were expecting greater improvements in speech intelligibility posttreatment. Therefore, they may have rated communication breakdowns and the subsequent need for repair more stringently on the posttreatment assessment. This phenomenon has been reported previously in studies showing that when individuals' strongly held expectations about an outcome are negatively disconfirmed (i.e., the outcome is not as good as expected), they will judge the outcome to be more undesirable or unpleasant than if they had no previous expectancy (Shepperd & McNulty, 2002). In the context of performance evaluation, an inability to meet a rater's high performance expectations is likely to result in ratings that are lower than the actual performance warrants (Hogan, 1987).

Prior to treatment, participants had an average Total Impact Score of 144.75 out of a possible 225 on the DIP, indicating a substantial disruption to their psychosocial well-being as a result of their dysarthria. This result is consistent with findings that dysarthria can cause difficulties performing everyday communication activities, leading to psychosocial issues such as changes to self-identity, disruptions to relationships, and feelings of stigmatization from the public (Dickson et al., 2008). Although the Total Impact Score increased immediately posttreatment, this improvement was not statistically significant. Individual analysis of the Total Impact Scores revealed that both of the stroke participants and five of the TBI participants made improvements on this outcome measure following treatment. In addition, although the mean score per statement for Sections A through D (i.e., effect of dysarthria on the speaker, acceptance of dysarthria, others reaction to speech, communication with others) increased following treatment, these improvements failed to reach statistical significance.

The DIP was recently used as an outcome measure in a small group study investigating the efficacy of traditional treatment protocols in nonprogressive dysarthria (Mackenzie & Lowit, 2007). Although participants in this study reported positive changes on the DIP posttreatment, the investigators scored the assessment using a different scoring convention to that described in the present study, and according to Walshe et al. (2009). Therefore, it is not possible to compare the changes in psychosocial well-being following traditional treatment with those observed following treatment with the new *Be Clear* program.

As the scores on all sections of the DIP increased posttreatment, with several approaching statistical significance, it may be that the null result reflects insufficient power in the statistical analysis due to the small sample size. In order to gain a better understanding of the impact of the *Be Clear* program on psychosocial well-being in individuals with nonprogressive dysarthria, further investigation in a larger group of participants is required.

With regard to the delivery of the *Be Clear* program, the treatment schedule seemed appropriate, acceptable, and viable for those participants involved. All participants who started the study completed the program as prescribed, attending 100% of their allocated treatment sessions. This result is consistent with other intensive speech programs such as LSVT LOUD, which is able to achieve significant improvements in speech production utilizing a similar treatment schedule (Ramig, Sapir, Fox, & Countryman, 2001). However, the applicability of the *Be Clear* protocol to participants living outside a metropolitan area needs further exploration. It may be for these people, or others with limited access to transport, that implementing the *Be Clear* program with a more distributed practice schedule (e.g., two session per week for 8 weeks) could help increase access to treatment while still achieving comparable improvements in speech intelligibility (Spielman, Ramig, Mahler, Halpern, & Gavin, 2007).

The results from this feasibility study indicated a need to modify some aspects of the program. Despite treatment materials for the functional speech tasks being modified for individuals with significantly reduced speech rate (e.g., reading tasks were limited to one or two sentences at a time), further changes to the *Be Clear* program may be necessary to ensure that these participants can complete all the prescribed treatment tasks in the 60 min allocated to each session. For instance, participants with slow speech may benefit from reducing the number of functional phrases and service requests practiced in the first half of the session. For P2 and P6, who exhibited significantly decreased speech rate, it was difficult to complete the five repetitions of these phrases in the first 20–25 min of the session. The increased time required for these two participants to complete these two tasks meant they had less time to practice reading, picture description, and conversational speech tasks. As such, it is recommended that future trials of the *Be Clear* program reduce the number of functional phrases and service requests for these participants (e.g., five functional phrases and five service requests, each repeated five times).

Limitations and Future Directions

Although the participants in this study achieved positive outcomes on a number of parameters, certain limitations to the study have been identified. First, the absence of additional baseline measurement points at specified intervals pretreatment, during the treatment, and posttreatment means that acquisition effects and longer term posttreatment trajectories were not available for these participants at a group or individual level. Utilizing time series measurements within a single-case study design in the future would allow greater insight into the effects of the *Be Clear* program and allow for the further refinement of the treatment protocol (Blanchet & Hoffman, 2014).

Further, the chosen outcome measures examined the general impact of treatment on speech intelligibility rather than specific acoustic changes that may have contributed to the clear speech benefit observed in this study. In order to ascertain whether acoustic changes occurred pre- and posttreatment, acoustic analyses of speech samples from the present study will be undertaken in the near future. It may also be beneficial to include qualitative interviews as an outcome measure in future studies, as such interviews may highlight additional psychosocial benefits of the *Be Clear* program that were not addressed by the DIP.

As previously mentioned, the small sample size used in this study resulted in decreased power of the statistical analysis, thus limiting the generalizability of the results. However, in view of the fact that this was a feasibility study, the lack of significant findings for some parameters may not be a substantial limitation at this stage. Replication of the study with a larger cohort of participants, however, is imperative.

Last, as the present study did not include a control treatment, it is unknown whether the outcomes of the *Be Clear* program differ to treatment techniques currently being utilized by SLPs in the clinical setting. Future Phase III and IV studies into the efficacy of this particular treatment protocol will provide treatment and placebo control groups for comparison in order to establish the effectiveness of this intervention.

Conclusions

The present study is the initial step in a programmatic evaluation of the *Be Clear* intervention, which has been developed to incorporate the principles of neuroplasticity and motor learning. The results from this feasibility study suggest that an intensive speech treatment focusing on an external focus of clear speech may be an effective and acceptable clinical intervention for people with nonprogressive dysarthria. However, future research involving controlled Phase III and IV studies are required in order to establish the efficacy of this dysarthria treatment.

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