1. TITLE PAGE

Title of Project: Speech Telerehabilition after stroke: Proof of Concept and Feasibility

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Organization: East Carolina University

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2. STRUCTURED ABSTRACT

Purpose: To evaluate the feasibility, acceptability, credibility and satisfaction of using a telerehabilitation approach to treat aphasia among stroke survivors. Scope: 30 stroke survivors with aphasia living in community settings participated in the study. Methods: We completed single arm proof-of-concept and feasibility study of aphasia telerehabilitation. Participants completed 12 telerehabilitation sessions for aphasia via a Laptop computer, with a student facilitator, at their location and a speech-language pathologist at the treatment location. WebexTM, a cloud-based videoconferencing program, was used for the study. Language-oriented treatment was provided to address the participants' aphasia. Primary outcome measures included: recruitment/retention, acceptability/credibility/expectancy and satisfaction. Results: 30 individuals with aphasia were enrolled and 22 completed the study. Treatment was judged to be credible/logical with participants reporting a mean score of 22.4/27 on the Treatment Expectancy Scale. Scores on the Client Satisfaction Questionnaire-8 averaged 31/32, indicating a high level of satisfaction with the telerehabilitation treatment approach. Participants deemed the approach credible/logical for treating aphasia. Participants were highly satisfied with the treatment. This approach offers stroke survivors opportunities for community access that is not available with home-based telerehabilitation. Key Words: aphasia; telerehabilitation; satisfaction.

3. PURPOSE

The development of a community-based aphasia telerehabilitation treatment approach for individuals residing in rural areas, is urgently needed as a potential alternative to address current access to aphasia treatment issues. The purpose of this study was to evaluate a comprehensive community-based telerehabilitation approach to aphasia treatment for stroke survivors residing in rural areas. The primary aim was to examine the feasibility, acceptability/ credibility and satisfaction of using a community-based telerehabilitation approach for treating aphasia among stroke survivors who reside in rural areas.

4. SCOPE

Background: Although in-home treatments are likely of greater convenience and needed for individuals with significant overall physical disability, traditional community-based telehealth approaches can improve access to care as well as offer greater opportunities for community socialization.

Context: Social contact in the community has been shown to be of high importance to individuals with aphasia as they want to be recognized as useful and continue to make a positive contribution to society. In addition, community interaction is critical to assisting individuals with aphasia regain self-confidence and self-worth.

Settings: The study was completed in community-based setting.

Participants: Participants were recruited locally from local inpatient and outpatient clinics at a local hospital, Veterans Administration health care clinic and community senior centers. Speech-language pathologists at the aforementioned clinics were notified at the onset of the study, and periodically, about the goals and objectives of the program. When potential participants were identified and appeared to meet inclusion criteria, their treating clinician provided them information about the study, as outlined in the Institutional Review Board (IRB)

approval. Potential participants were then contacted the study's principal investigator (PI) and indicated an interest in the study, and a face-to-face meeting was scheduled to evaluate their ability to meet all inclusion criteria and enroll in the study.

Incidence/Prevalence: Aphasia occurs in approximately 1/3 of all stroke survivors and the sample recruited for this study was representative of the aphasia population.

5. METHODS

Study Design: This study was a single arm, proof-of-concept and feasibility study of aphasia treatment, administered using a telerehabilitation approach.

Data Sources/Data Collection: The primary outcomes for this feasibility study were measures of recruitment success, completion of treatment sessions/retention, acceptability/credibility and expectancy and satisfaction with the treatment approach. Recruitment success was based on the number of participants approached and enrolled in the study. Completion of treatment/retention was calculated as the number of treatment sessions completed, missed sessions and participants who dropped out of the study. Acceptability/Credibility and expectancy with the treatment was measured pre-treatment using the four-item Treatment Expectancy Scale. The scale consisted of three Likert-style questions on a scale of 1-9, designed to examine acceptability/credibility with responses of: 1=not logical at all, 5=somewhat logical and 9=very logical, for a maximum score of 27. The final question designed to examine expectancy (expected improvement) allowed the participate to rate their expected improvement on a scale of 0-100%. Satisfaction with the treatment was measured post-treatment with the eight-item Client Satisfaction Questionnaire (CSQ-8). The CSQ-8 was designed to measure client satisfaction with services provided. All questions were designed to report low satisfaction (score of 1) to high satisfaction (score of 4) for a total score of 32.

Interventions: Telerehabilitation Platform: The speech rehabilitation treatment was delivered via WebexTM (http://www.webex.com/), a cloud-based videoconferencing program that allows real-time exchange of video and audio for individuals at a distant location via a secure internet connection. Webex offers both full screen and side-by-side sharing views, which allowed the research team and patient collaborative sharing of treatment materials and other documents required for the administration of the aphasia treatment. The Webex screen-in-screen feature allowed the participants to see the treatment stimuli and clinician simultaneously. The treating clinician for the project provided the aphasia telerehabilitation from a medical campus aphasia laboratory site, and the individuals with aphasia received the treatment at a remote community-based site (local school or senior center). The general aphasia treatment used via telerehabilitation was the Language-Oriented Treatment (LOT). LOT was designed to address a range of language issues among individuals with aphasia. The LOT approach is highly structured and offers important advantages with regard to treatment fidelity and replication. Treatment targets for receptive deficits included: improving access to word meanings and changing the individual's communication environment to support auditory comprehension. Treatment targets for expressive deficits included: spoken output with written letters, repetition and reading aloud. Participants were scheduled to receive 12 treatment sessions over a six-week period.

Measures:

1. Western Aphasia Battery-Revised (WAB-R) – is a comprehensive test battery designed to measure aphasia severity after stroke. The test is designed to generate an aphasia quotient (AQ) which is a metric of aphasia severity.
2. National Outcomes Measures (NOMS) – is a clinician reported measure of functional communication outcome. NOMS utilizes a series of seven-point assessment scales to obtain functional abilities and over multiple time points. A score of one indicates minimal or no ability whereas a score of seven indicates independence in the measured area.
3. ASHA Quality of Communication Life Scale (ASHA-QCL) – is a measure of patient-reported quality of communication. The ASHA-QCL uses 18 visual analog scales designed to measure quality of communication life from the perspective of adults with communication disorders. The ASHA-QCL total score and scores from questions #2 (easy to communicate) and #14 (confident I can communicate) will be used in the analysis.
4. Treatment Expectancy Scale – is a measure of: 1) how logical the treatment appears, 2) how confident patients are about the treatment, 3) their expectancy of success and 4) how successful they believe the treatment will be in improving their communication disorder.
5. Client Satisfaction Questionnaire (CSQ-8) – is a measure of client satisfaction with the service provided.

Limitations: The study is a feasibility trial with a limited number of participants. One primary limitation is generalization to the greater aphasia community. Individuals with aphasia can exhibit communication deficits ranging from very mild to severe with more impaired individuals potentially having some difficulty completely responding to outcome measures.

6. RESULTS

Principal Finding 1. Feasibility (Primary) - Participants were 17 men and 13 women with aphasia, with a mean age of 61 years old and 14 years of education, were enrolled in the study. The treatment was judged to be credible/logical with participants reporting a mean score of 22.4/27 on the Treatment Expectancy Scale. Participants also expected ~70% improvement. Post-treatment scores on the Client Satisfaction Questionnaire-8 averaged 31/32, indicating a high level of satisfaction with the telerehabilitation treatment approach.

Principal Finding 2. Young Adults with Aphasia (Secondary) Young adult persons with aphasia in this study exhibited very small social networks with the most salient relationships consisting of immediate family members. Mothers were the primary caregiving relationships for the two most impaired PWA. Pre-stroke friendships were dissolved or reduced at the onset of aphasia. The most impaired PWAs spent most of their days in isolation without a consistent communication partner.

Principal Finding 3. Cost-Improvement (Secondary) - 13 participants demonstrated a positive change in Western Aphasia Battery-Revised Aphasia Quotient (WAB-R AQ) scores following the telehealth treatment. WAB-R AQ change scores ranged from -8.1 – 14.5. Cost improvement values for the 13 individuals who improved ranged from $89 - $864 for each one-point of improvement. The best cost-improvements were achieved by individuals within the first 18 months of aphasia onset and those with the most severe aphasias.

Principal Finding 4. Aphasia Recovery Prediction (Secondary) - Using Bayesian methods to predict aphasia recovery and anomic aphasia and non-Black as a reference, Geweke Diagnostics—a measure of model predictiveness—showed that the level of WAB-R AQ change varied significant by race, type, age and education. Parameter estimates indicate that change from baseline is smaller for Blacks. As education level and age increase, change in WAB score falls. Individuals with Broca's aphasia experienced a smaller change in WAB-R AQ, compared to patients with anomic aphasia. Individuals with global aphasia had a large increase in WAB-R AQ score, likely due to their increased initial severity and larger potential gains. Individuals with conduction aphasia had only slightly higher level of improvement, but the coefficient (0.64) was relatively close to zero. Surprisingly, the interaction between race and age was negative and statistically significant indicating that older blacks, relative to younger Blacks of the same aphasic type, experienced smaller change in WAB-R AQ scores.

Discussion/Conclusion 1. Participants in this study deemed the approach credible/logical for treating stroke aphasia. Those completing the study were highly satisfied with the treatment. This approach offers stroke survivors opportunities for community access that is not available with home-based telerehabilitation.

Discussion/Conclusion 2. Young adult stroke survivors with aphasia have significant changes in their social network structure after stroke, but it is unclear if the observed changes in social network structure is more related to age or level of communication impairment.

Discussion/Conclusion 3. The cost of improvement for aphasia are influenced by aphasia type, severity and time-post-onset. Individuals with severe aphasia are likely to have the greatest cost-improvements. In addition, individuals many years post-onset can continue to make clinical improvements and at low costs.

Discussion/Conclusion 4. Bayesian methods offer aphasiologists the opportunity to gain insight into critical aphasia recovery prediction using smaller study samples. This information should be combined with imaging studies to present the fullest picture of aphasia recovery patterns.

Significance: The use of community-based aphasia telerehabilitation is feasible for the comprehensive treatment of aphasia. Young adults stroke survivors are particularly vulnerable to isolation due to aphasia and this approach offers the added benefit of community reintegration. Treatments are cost-effective for specific populations and the outcomes data can be utilized to predict aphasia outcomes on a larger scale.

Implications: Community-based telerehabilitation for aphasia can be a feasible, satisfying and cost-effective approach to treatment for individuals with a wide range of severity levels. The findings reported here should be considered the first step in the development of systematic and programmatic research, designed to identify the best approaches for telerehabilitation for aphasia to improve access to treatment for individuals with aphasia.

7. LIST OF PUBLICATIONS AND PRODUCTS

Ellis C, Briley PA, Fang X. (2020). Credibility, expectancy and satisfaction with community-based telepractice treatment for aphasia. Stroke, 51:ATP143.

Ellis C, Phillips R, Hill T, Briley PM. Social network structure in young stroke survivors with aphasia: A case series report. Seminars in Speech and Language, 2019, 40(5): 359-369. DOI: 10.1055/s-0039-1688695.

Ellis C, Mayo R. Young African American adults with aphasia: A case series. Journal of the National Black Association for Speech-Language and Hearing, 2019, 14(1): 33-45. No DOI.