

Feasibility of using a digital platform to deliver Speech and Language Therapy for Parkinson's

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Introduction

Beautiful Voice has developed a digital platform to assist with the delivery of speech and language therapy.

It quantifies users' speech, voice, and language qualities while providing evidence-based exercises to optimise Speech and Language Therapy provision. Beautiful Voice aims to reduce workload for Speech and Language Therapists (SLTs), while helping clients receive additional Speech and Language Therapy at home for more effective rehabilitation.

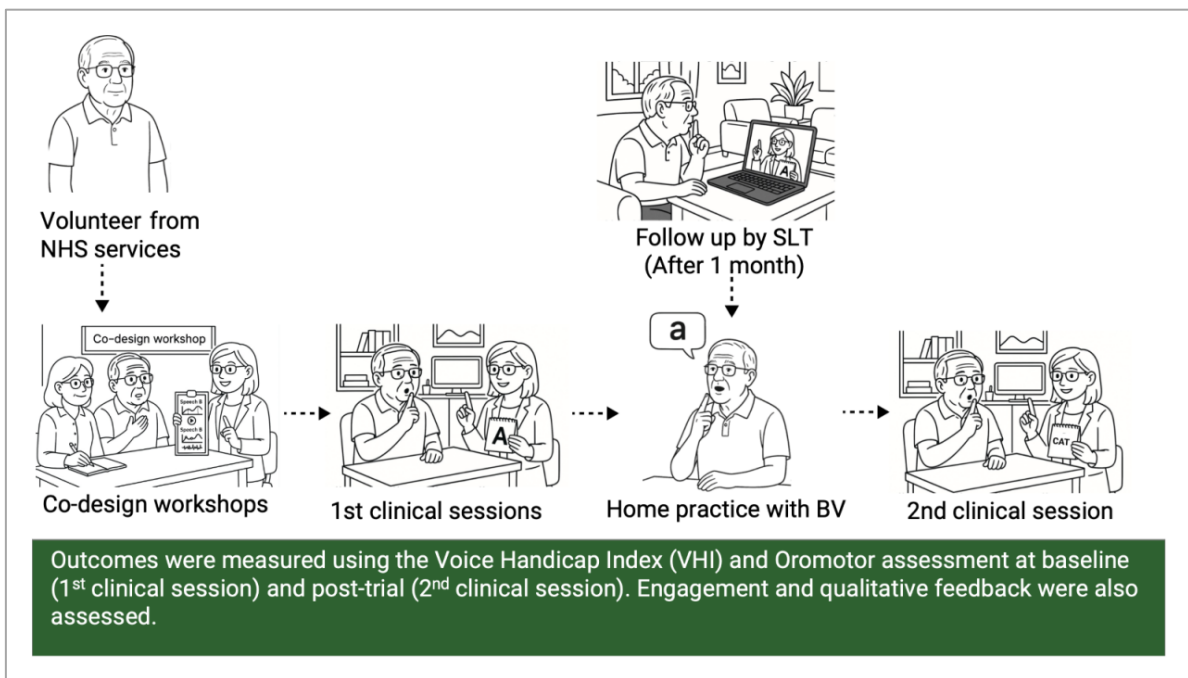
Approximately 10 million people worldwide are living with Parkinson's disease. Over 90% of people with Parkinson's (PwP) experience speech and language difficulties over the course of their illness. These challenges often include quieter speech volume and monotone voice, slurred or imprecise articulation, altered speech rate, and difficulties with working memory and word retrieval. Such impairments often result in increased care costs, reduced confidence and independence, and diminished wellbeing.

Research demonstrates that high-intensity, high-frequency Speech and Language Therapy leads to both short- and long-term improvements in communication for PwP. However, the global shortage of SLTs severely restricts access to therapy, resulting in long waiting times and suboptimal outcomes.

Developing a computer-based therapy platform offers an opportunity to increase therapy frequency and depth (dosage), accessibility, and SLT efficiency. Funded by Innovate UK Women in Innovation, Beautiful Voice in collaboration with Caroline Bartliff from the University Hospitals of Derby and Burton NHS Foundation Trust have designed a service evaluation project involving PwPs and clinicians to explore the opportunities and challenges associated with using digital technology to support Speech and Language Therapy. This led to the development of the following research questions:

1. Can SLTs use a computer-based digital platform to deliver Speech and Language Therapy in daily practice?
2. What effects does computer-based Speech and Language Therapy have on clinicians, PwP, and the NHS?

To go about answering these research questions, the project consisted of two parts: co-design workshops with clinicians, patients, and families, culminating in service evaluation using the developed platform among the Parkinson's outpatient/community department. This report will detail the key results and findings from this project.



Part 1 – Co-design workshops

There were a total of 6 PwPs/PSPs (Progressive Supranuclear Palsy), 6 caregivers, and 5 SLTs participating across 3 different co-design workshop sessions.

Participants were recruited through NHS services to participate in co-design workshops, where user feedback and feature iterations were discussed.

Results and Findings

Results of exercises:

Most participants would like to have more access to review the results stored on Beautiful Voice. Some participants highlighted that they would like results to be more contextualised for them and compared against benchmarks, e.g. in contrast to themselves or to people in general.

Ease of access:

For several participants/carers (those who are less familiar with using technology in this way) find that going to use platform requires a lot of effort and preparation, as they tend not to use computers regularly. At the same time, they often find using a phone difficult due to eyesight and dexterity issues, in addition to lower tech literacy.

Cognition:

Almost all participants had some degree of cognitive difficulty, affecting their ability to remember what they have done on the platform, using the technology in general, and inputting their password.

Exercises:

There is a great interest in personalised and functional exercises. Exercises to include and practice conversation starters were suggested.

Loudness Meters:

One participant suggested different types of loudness meters to be added on the platform. However, after adding it, very few participants engaged with the option of changing the loudness meter. There is a conflict between adding more options for users who struggle using technology, meaning options make the platform more difficult to engage with.

Data security:

Most participants did not feel that data held by Beautiful Voice was very sensitive and therefore did not feel that higher security measures are necessary. Ease of access is more important than additional security measures.

Conclusion

Based on the above feedback, the Beautiful Voice platform was improved and then evaluated by the Derby Parkinson's team to investigate the impact of using the platform on its service, as discussed below in Part 2 of this project.

Part 2 – Service evaluation

SLTs from outpatient settings tested the platform with PwPs who were referred to their services. These PwPs had communication difficulties and were able to use digital technology with assistance.

The SLT met each PwP for an initial session (acting as the baseline measure), in which they were introduced to the platform. The SLTs prescribed personalised exercises for self-practice at home via the platform, which also captured PwP adherence and voice metrics during the practice. The SLT also conducted both the Oromotor and Voice Handicap Index (VHI) assessments during this initial session.

An Oromotor examination particularly focuses on the structure and function of an individual's chewing and swallowing muscles, i.e. assessing potential dysarthria (difficulties with control of or with weak muscles used for speech) and dysphagia (difficulties swallowing). The VHI is a self-assessment tool assessing the impact of voice disorders on an individual's quality of life, considering three areas: emotional, physical, and functional.

Participants were expected to self-led the practice at home following the personalised treatment plan on Beautiful Voice for one month. SLTs oversaw the participants' performance remotely once a week via the platform in case of any adjustment is needed. A review session was provided after 1 month, in which the Oromotor and VHI assessments were administered again. Engagement and qualitative feedback were also gathered and assessed.

A total of 26 PwPs referred to the outpatient services used the platform as part of their usual care.

Results and Findings

The primary outcome measure for this project was voice loudness. Secondary outcome measures included phonation time / intelligibility.

On average, each participant spent 9 hours of independent practice at home (20 minutes per day). 70% of patients were highly engaged with the therapy (practised 6 days or more) and showed moderate to high improvements over 1 month:

- 4.3 dB increase in loudness (statistically significant)
- 2% increase in intelligibility (statistically non-significant)
- 2.2 seconds increase in phonation time (statistically significant)

Such results are similar to that of LSVT (Lee Silverman Voice Treatment) Loud - the standard of care for Parkinson's, but with only 20% of the total number of therapy sessions expected from SLTs, saving £640 per patient per treatment.

Additional results:

A significant correlation was observed between the number of days practiced and dB gained; the model showed a 0.19 dB gain per day practiced.

The number of days practiced was found to be more important than time practiced: making practice a daily habit is more significant for improvement than total duration of practice.



Y axis = Loudness gain (dB)

X axis = Number of days practiced

It is important to note that, without intervention, a natural downwards loudness trend is expected for these participants due to the progressive nature of Parkinson's.

Conclusion

Results indicate strong support from clinicians and PwPs for an online platform to enhance therapy access. Results were similar to LSVT (Lee Silverman Voice Treatment) Loud - that is, the standard of care for Parkinson's - with 20% of the total number of therapy sessions expected, saving £640 per patient per month. Participants highlighted the platform's potential to increase therapy dosage, promote self-management and information/knowledge sharing, and enable remote monitoring and feedback to clinicians. Beautiful Voice has identified the need to reduce barriers to access (to decrease the number of users with very low adherence) and increase the variability of exercises (to increase the longevity of users who are adherent), especially given that loudness gains had high correlation with adherence. Based on user feedback, the platform will be further improved and undergo a randomised controlled trial to investigate its effectiveness in improving voice and speech symptoms and cost-saving for the NHS.