

Design of a computerised treatment for short-term memory deficits in aphasia

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Design of a computerised treatment for short-term memory deficits in aphasia

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Background: The treatment of auditory-verbal short-term memory (STM) deficits in aphasia is a growing avenue of research (Martin & Reilly, 2012; Murray, 2012). STM treatment requires time precision, which is suited to computerised delivery. We have designed software, which provides STM treatment for aphasia. The treatment is based on matching listening span tasks (Howard & Franklin, 1990), aiming to improve the temporal maintenance of multi-word sequences (Salis, 2012). The person listens to pairs of word-lists that differ in word-order and decides if the pairs are the same or different. This approach does not require speech output and is suitable for persons with aphasia who have limited or no output. We describe the software and how its review from clinicians shaped its design.

Description: The software comprises a clinician and an end-user tool.

Clinician tool (figure 1). Clinicians can produce treatment content and feedback using digital audio files (recorded separately with audio recording software). Treatment content is real words, but other items could also be used (pure tones, non-words or sentences). The audio files are selected for treatment from a list. Individual sound files make up the pairs of word-lists. Clinicians can manipulate rate of presentation of words and delay of presentation between word-list pairs. Feedback to end-users can be enabled or disabled for assessment or treatment respectively. The tool records end-user's performance in Excel files.

End-user tool (figure 2). Treatment is delivered through a touchscreen application called "Memo". The word-lists are played from the audio recordings. After listening, the end-user touches a button to respond (i.e. same or different). Audio-visual feedback is provided. An animated "virtual therapist" provides visual cues about what to do at each stage. A progress chart indicates the number of treatment items. At the end of each treatment session a percentage score conveys overall performance (depicted on a hill). The tool can be used either with the clinician present but it could be self-administered.

Review from clinicians: Reviews of successive prototypes with clinicians (20 in total) raised potential enablers and challenges to adopting the software.

Enablers

Use: Clinicians said the software could easily replicate treatment content across different end-users. It could facilitate repeated practice and enable precise/consistent delivery that is difficult or boring.

Benefits: The software would allow independent work by end-users as well as involve family and/or carers. The treatment could be personalized. The software was clear but not childish and could be useful for improving attention and overcoming fear of technology.

Motivation, progress, feedback: Increasing motivation was important. The software should indicate the level of difficulty of the treatment and individual progression. An initial progress bar was not understandable; this was replaced with a depiction of a hill.

Same/different concept: End-users may not understand the same/different concept explained in this way. These comments prompted a replacement of an initial video with practice trials, and the use of audio-visual examples to convey the concept of same/different.

Challenges

Flexibility, time. Flexibility to customise treatments was appreciated, but the creation of the individual word-lists would be time-consuming and difficult. Pre-made word-lists could be provided.

Limited permissions. Limited permissions to install software into a healthcare system-issued computer. One possibility would be to put the software on end-users' own devices.

Technological confidence. Some clinicians may not have the skills or confidence to install the software, nor be familiar with sound recording/editing software. Several did express a willingness to try.

Jargon. Although the prototype was clear and user-friendly, one clinician noted that the language used in the end-user tool still contained technical jargon (to be addressed in the next iteration).

Conclusion: Feedback from clinicians suggests that the application has good potential to be adopted. Their feedback highlighted that practical aspects of adoption must be considered as carefully as the design of the software itself. The software will be freely available from February 2014; the authors can be contacted for details.

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