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# Co-design of a Feedback Questionnaire for ICT-delivered Aphasia Rehabilitation

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## ABSTRACT

Aphasia is an acquired loss or impairment of the language system that can occur after stroke. Information and Communication Technologies (ICT) can provide an option for the delivery of intensive aphasia rehabilitation but the users' views (i.e. people with aphasia) must be considered. There is no consensus measure of self-reported feedback in ICT-delivered aphasia rehabilitation and existing ICT usability questionnaires do not present questions in an accessible format for people with aphasia. This research employed a co-design process in which a group of adults with aphasia and the researchers collaborated in design workshops. The final product is an online feedback questionnaire that is accessible for people with aphasia. It provides relevant and meaningful self-reported feedback on participant engagement in ICT-delivered aphasia rehabilitation. This feedback is important when planning and monitoring aphasia rehabilitation.

## Author Keywords

Aphasia rehabilitation; self-reported feedback

## ACM Classification Keywords

Human-centered computing~Accessibility design and evaluation methods.

## INTRODUCTION

Aphasia refers to an acquired loss or impairment of the language system. It can affect a person's ability to understand and express themselves effectively through spoken or written modalities. Aphasia can impact well-being and ability to engage in everyday social activities. It can also impact on access to digital technology[1]. Use of computer technology has been promoted as an efficient route for the delivery of intensive aphasia rehabilitation[2]. Computer therapy is effective when compared to no therapy and may be as effective as clinician-delivered therapy for specific conditions[3]. Information and Communication

Technologies (ICT) may provide an option for intensive rehabilitation for people with aphasia but consideration must be given to the feasibility and acceptance of this mode of rehabilitation. This is especially important as many ICT applications for people with aphasia have not involved people with aphasia in the design process, with notable exceptions from Wilson et al. and Moffatt et al. [4, 5].

## RELATED WORK

A number of studies have begun to explore the views of participants with aphasia engaging in ICT-delivered aphasia rehabilitation. However there is no consensus measure of self-reported feedback in these studies. The methods of feedback include interviews[6-12], written narrative[13] and questionnaires developed for the study[9, 14, 15]. These studies do not use existing questionnaires of user experience, ICT acceptance or self-reported feedback. Current available questionnaires do not present questions in an accessible format for people with aphasia and most use language, structure and formatting that is unapproachable for people with aphasia. This research aimed to develop a self-reported feedback questionnaire incorporating an aphasia accessible version of the NASA TLX[16]. Such a questionnaire will facilitate self-reported feedback of user experience when engaging in ICT-delivered aphasia rehabilitation. The NASA TLX is a subjective measure of workload with 6 subscales (Mental, Temporal and Physical Demands, Performance, Effort and Frustration). These have descriptions which can be visually represented to improve access for people with aphasia. The questionnaire would also provide relevant and meaningful feedback on ease of use and functionality of ICT-delivered aphasia rehabilitation and help in planning and monitoring progress.

## CO-DESIGNERS

The researchers and a group of adults with aphasia collaborated as co-designers in participatory design workshops. Ethical approval was obtained from the local Research Ethics Committee. Each co-designer with aphasia was visited by a researcher in their home for an initial session prior to the workshops. The Western Aphasia Battery was administered in order to profile the type and severity of aphasia[17]. This information was important in order to identify how best to support individual's communication needs during the design workshops. Six co-designers (5 male, 1 female) were recruited; age range 43 to 76 years (mean = 60.7 years), with mild to severe aphasia (WAB AQ range 24.4 to 83, mean = 64.7).

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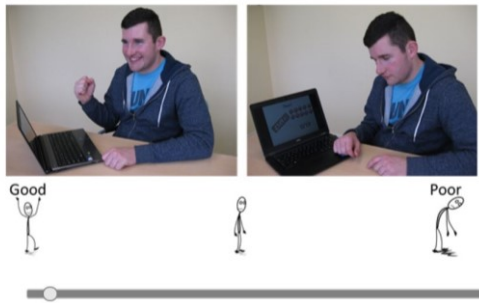
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14. How **successful** were in you achieving your goals?  
Were you **satisfied** with your work?



**Figure 1.** The key information words in the questions are in bold font and the picture stimuli provide additional cues

Participants were between 2.5 and 11.5 years post stroke (mean = 5.7 years). Each co-designer was asked about their pre-stroke and current use of technology[18, 19]. There was a variety of technology use and abilities among the group. Five of the co-designers used ICT devices (smartphone, tablet, laptop or computer) and the sixth person used a basic mobile phone for calls only. Of the five who used internet enabled ICT devices, the most popular online uses were information searches (3) and entertainment (3), followed by email (2), shopping (2), banking (2), video-chat (2), diary/reminder (2) and speech and language therapy (2). Only one group member used social media and gaming applications. One co-designer worked as a computer programmer before his stroke but was not working in that role at the time of the research.

### WORKSHOPS & CO-DESIGN TECHNIQUES

Wilson et al. implemented a co-design project with people with aphasia and used a variety of techniques to facilitate their ability to engage in the design process[4]. We utilised supported communication strategies throughout the workshops to facilitate engagement in the design activities. Techniques such as visual analogue scales and ranking tasks were mostly used in the initial workshops and prototype testing in the final three sessions. All six workshops were video- and audio-recorded. Each session was reviewed in order to identify if any information was overlooked by the facilitator during the session and to clarify that all recorded information was accurate. The ranking and consensus for each item was recorded in the session and this was also reviewed and cross-referenced against the video recording.

### CO-DESIGN AS AN ITERATIVE PROCESS

The initial workshop asked co-designers to discuss their views on ICT. The group was asked to think about “good” and “bad” aspects of technology. This drew on experiences of using a variety of ICT devices and generated discussions about successful use, frustrations, challenges and changes in use and ability after stroke. The second workshop explored potential questions to be probed in the questionnaire related to function and usability, emotional impact and support/independence.

Ease of Use and Functionality items	NASA TLX items
1. Timepoint	9. How mentally demanding was the task?
2. How much help did you need when using the computer/laptop?	10. How physically demanding was the task?
3. How easy was it for you to turn on/off the computer/laptop?	11. How hurried or rushed was the pace of the task?
4. How easy was it for you to use the mouse?	12. How successful were you in achieving your goals?
5. How easy was it for you to log into the programme?	13. How hard did you have to work to achieve your goals?
6. How easy was it for you to find the right level?	14. How insecure, discouraged, irritated, stressed and annoyed were you?
7. How easy was it for you to understand the pictures?	
8. How easy was it for you to hear the sentences?	

**Table 1.** Overview of questionnaire items

The third workshop attempted to generate aphasia accessible questions incorporating visual cues to support comprehension. A set of photographs with one researcher acting out scenarios were used to determine the most appropriate actions and visual cues. These helped to inform the photographs that were later taken with an actor. These photographs were reviewed in the fourth workshop. Most were agreed and defined for each question with some requiring minor changes to aid understanding e.g. addition of an egg timer to indicate time. The use of single- versus binary-choice question format generated discussion with some co-designers favouring one format over the other. However, it became apparent that some questions would benefit from a binary-choice format e.g. when probing *Performance*, the visual stimuli accompanying the question presented two images; one image represented *satisfied*, with a successful cheering actor and the written cue “good”, and the second represented *unsatisfied* with an actor with his head lowered and the written cue “poor” (see Figure 1.). Other questions used a simple question structure with one supporting image to aid question comprehension. The questions and images were developed into an online survey prior to the fifth workshop. This prototype was trialed by the co-designers in the fifth workshop while completing computer-based activities such as gaming, language and/or cognitive rehabilitation activities. Further feedback was provided for minor edits and the questionnaire was finally reviewed in the sixth workshop. The questionnaire has 14 questions (Table 1.). The first question is related to the time point (to identify repeated uses), 7 questions are related to the ease of use and functionality of the rehabilitation programme being tested as well as level of assistance required and the final 6 questions are related to the subscales of the NASA TLX[16].

### CONCLUSION AND FUTURE WORK

This co-design activity outlines an iterative design process that can be used with other groups of ICT users with or without communication difficulties. The feedback questionnaire is being piloted in a feasibility study investigating ICT-delivered aphasia rehabilitation and will provide data on user experience and acceptance of ICT-delivered aphasia rehabilitation.

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