Prompting people with dementia to carry out tasks

What works and why?

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This two-year project aims to investigate in detail how prompting can help to guide people with dementia through tasks independently in a domestic setting. Four formats of prompt (text, audio, video and picture) are being compared with each other during domestic user-testing visits, to establish the relative strengths and weaknesses of each format. The importance of providing overall task context at each step, and ways of manual or automatic forwarding to the next instruction, will also be explored.

Early findings from user testing have shown that comparable text or audio prompts are more effective means of prompting than picture or video prompts, and that there is strong potential for people with dementia to be able to control the timing of the prompts to work through the task at their own pace. These findings will be combined and the prompts will be developed iteratively so that prototype pieces of prompting technology can be created to enable a person with dementia to successfully carry out a task independently.

Keywords: Dementia; prompting; user testing; sequencing

I. INTRODUCTION

People with dementia can experience problems carrying out tasks or activities successfully because of the way that their short-term memory is impaired. A typical problem associated with this type of impairment is that people with dementia can easily lose track of where they are within a task, and be unable to successfully continue through to the end of the task. As a result, initiating the steps within each task and stringing them together into a complete task can be difficult, even though someone with dementia can still carry out each of the separate stages.

There is an increasing range of technology designed for people with dementia, some of which include aspects of prompting, but there has been little direct comparison of why different types of prompt work better than others.

Previous work in the field, such as the development of the GUIDE system [1] and the COACH system [2] has indicated that some types of prompting seem to be more effective than others. However, although it is understood for example that text instructions can be clear, and audio instructions can lead to good understanding, the different types of prompts tend not to be compared directly with each other in a controlled setting. There is therefore a need to understand in detail why different approaches work better than others, in order to best design prompting technology which might enable a person with dementia to carry out a task independently.

This two-year ongoing project is sponsored by the Dunhill Medical Trust, and employs detailed user-interaction in a domestic setting to explore the design of task prompting for people with dementia.

The overall aim is to understand how prompting can best be used to support someone with dementia through a sequence of steps in a task, and to incorporate these findings into the design of appropriate technology to support task sequencing. A means of scoring the success of each type of prompting design allows some objective comparisons which, when combined with rich video data, provides a wealth of information about the types of prompting that are being trialed.

II. METHOD

Up to ten volunteers with mild to moderate dementia and their respective spouse/caregiver/relative are being recruited gradually throughout the project. The work has received approval from the University of Bath's Department for Health Research Ethics Committee.

All of the user testing work is being carried out in people's own homes with a relative or spouse present, with visits typically lasting for an hour. This gives the benefit of reassurance for the person with dementia, and some additional insight into the activities being carried out. The domestic setting enables the people with dementia to be in familiar surroundings. Each pair of volunteers is visited typically five or six times spaced at least two weeks apart, with the option to withdraw at any point.

The research aims to explore the following three areas:

1. Comparative testing of four types of prompt format (text, audio, picture and video) each in isolation, to determine how effective they are at conveying the information and causing a person with dementia to act on them.
2. Testing of different ways of conveying the context of the each step of the task, i.e. showing that the current instruction is one of several instructions, with a

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means to an end. This idea was suggested for further exploration in previous work by Orpwood *et al* [3].

3. Testing of how to move from one instruction to the next either automatically or manually initiated by the person with dementia, without using complex monitoring or imaging.

In order to compare objectively the four different ways of conveying each prompt, it was necessary to use a standard task. This task had to be chosen carefully, so that it was self-contained, could be broken down into three clear steps, and could be brought to domestic visits and set up quickly and easily and be reproducible in different households.

The task chosen for this purpose was a greetings card activity. This matched the required criteria and involved performing some, but not all, of the actions associated with writing and sending a greetings card. This allowed the researchers to tell whether the volunteers were following the instructions provided or simply improvising based on the materials provided.

The greetings card task was a three-stage task in which the person with dementia was provided with a card and envelope, some stamps and a pen, and asked to carry out three specific steps: Take the card and sign it with your name; put the card in the envelope; put a stamp on the envelope. The test set-up comprised the materials on a sheet of card placed on a coffee table directly in front of each volunteer, and a prompting screen (for the visual prompts) placed directly in front of the participant, just behind the card materials.

The prompts were provided by either audio prompts or screen-based prompts, depending on which format was being tested. The screen used for the early stages of the project was an Asus Eee Top, which is a 15.5" touch screen computer which appears to be just a screen when used without a mouse or keyboard. Touchscreens have previously been shown to be useable by people with dementia [4] and allow flexible design which is important in iterative user testing.

The wording of the audio and text prompts was identical, and all of the visual prompts (video, picture and text) were provided using Microsoft PowerPoint slides to give flexibility and quick turnaround of any required design changes. This removed the need for lengthy technology design between visits. The text prompts were provided in large, clear black sans-serif font on a plain white background, with the clauses separated onto different lines for ease of reading and understanding. The audio prompts also used a PowerPoint slide (viewed only by the researchers), with each prompt being activated by the researcher clicking on a line of text which contained the same content as the audio prompt, e.g. "Put the card in the envelope". The audio prompts used recordings of the same researcher throughout for consistency, since any changes to the voice could affect the response to the prompts. The picture and video format prompts were photos and video footage of the actual materials used in the task, with one of the researchers carrying out the task, shot from the perspective of the person doing the task. No sound track was used for the video footage. The prompts were all tested with the first three volunteers and refined as required in order to minimize any ambiguity or confusing wording.

Once the idea of trying out some instructions had been explained, each test was started by the researchers using the phrase, "I'm going to set you a task to do, see how you get on". This allowed the task to be started without describing what the task entailed. The first instruction was then provided by one of the researchers using a mouse or keyboard located away from the screen. Each instruction was then provided using the same method, once it was clear that the previous step had been completed. The tests were video-recorded to provide rich information about the person's reactions throughout the task.

Any support or reassurance given by the researchers during the testing was designed to be as consistent as possible, using as far as possible only the phrase, "Just follow the instructions [on the screen]", in response to any queries by the person with dementia during the activity. Where it was clear that the prompt for a step needed to be repeated, this was provided by displaying or repeating the prompts, depending on its format.

A further standardized task was also introduced into the testing. By also testing a task which involved slightly different types of activity within its steps, useful observations could be made about whether some of the successes of the formats were a results of the nuances of the task itself and not only a result of the prompt format. The different types of action in the tasks could require different types of prompt for best effect, e.g. describing pressing a button, as opposed to pointing to a button, is more difficult to convey with a still image than with text, and this could not be explored in a task which did not involve pressing buttons.

This second standardized task involved using a portable CD player with speakers to play a CD. This task required understanding how to work a specific piece of equipment, for example sliding buttons or selecting a button from several similar ones. The prompts were designed in the same way as those for the greetings card task to give as consistent instructions as possible between tasks.

Each person with dementia chose an additional task which was individual to them and which they would ideally like to be able to carry out independently. These tasks included emptying a dishwasher and putting the contents away; getting tea from the fridge at tea time; and switching on a games console to enable the volunteer to play tennis on a Nintendo Wii console. Prompts for these extra tasks were developed alongside the more objective testing of the prompting formats, allowing a combination of direct learning from the findings of the standard task and a more exploratory approach. These extra tasks also enabled the researchers to understand how to tailor prompts for a particular activity, based on the person's own surroundings, and to understand more about tasks which were not carried out in a single location while seated with the prompts physically close by and within line of sight throughout the task.

The different formats of prompt needed to be compared objectively, and this is being done by using a scoring system being developed as part of the project. This scoring system allows comparison by watching the video footage of the tests and scoring subjective aspects such as, "Does the person

understand what the instruction is asking them to do?" and, "Does the person start each step of the task using only the prompt?". The scoring system allows the four different formats to be ranked for each person, rather than comparing absolute scores between volunteers. These rankings will indicate whether there are clear, objective differences between the format types.

This scoring system is also suitable for comparing how well the tasks are completed when researching the other research questions about how best to move to the next instruction, and whether showing context for each step is helpful.

Some testing has been carried out to assess a preliminary "self-forwarding" design. This uses a combination of text and audio prompts (simultaneously) and uses a simple "touch for next step" button on the touch screen. Different aspects of this design are being explored, to include timings and visual appearance, as well as ways of encouraging the person with dementia to touch the screen to obtain the next instruction. This has been tried so far on the greetings card task, emptying a dishwasher, and getting a pre-prepared meal from the kitchen.

III. EARLY FINDINGS

Four participants have so far tried out all four types of prompt format for the greetings card task, and these tests are being analyzed. The video footage gives rich information about the prompting and the relative effectiveness of the types of prompt.

All four volunteers who carried out these tests were able to read and understand the text prompts, even if they were not then able to understand how to act on them. For example, the text would typically be read out loud, then thought about briefly, then acted on, or in some cases this elicited questions such as "What card?" in the first stage of the task before noticing the greetings card in front of them. The use of text seemed clear and unambiguous, and appeared to imply the sense of an instruction rather than a passive statement.

The audio prompts seemed to elicit responses as though a real voice were giving the information. There seemed to be good understanding of the information when it was given by a voice, and was usually followed by action.

The picture prompts sometimes did not lead to the person with dementia trying to do the task step being shown in the photo. The pictures were viewed more passively, and did not feel like instructions in same the way that the text instructions were. Detailed actions are also more difficult to convey using a single, still picture compared with using text, and the content was therefore perhaps more ambiguous. It usually took longer for the person with dementia to interpret the content of the picture prompts than that of the text or audio prompts.

The video prompts, which one might expect to be clearer than the picture prompts since they provided more information, still required some interpretation, and again appeared to be treated less like instructions and more like something to be watched passively, even though they were very short video clips of just a few seconds. Watching the video clips and trying to interpret them for each step seemed to draw attention away from the idea of following a set of instructions, resulting in a loss of "flow" of the task.

There were some aspects of the task steps themselves which were better suited to some formats of prompt. For example, using text or audio messages to convey the idea of signing the card with one's name was clear, whereas this idea was much harder to convey using picture and video prompts.

Preliminary testing of a set of prompts which enabled the person with dementia to move the instructions on from step to step themselves showed two notable ideas. Firstly, using the touch screen in this way appeared to give the person a sense of control, and of being able to work at one's own pace to allow the overall task to "flow" better. Secondly, when tested with two of the volunteers' own tasks, it became clear that the strong potential shown during the greetings card task was somewhat reduced in tasks where the person moved their line of sight away from the screen or physically moved or turned away from the source of prompting. This is something that will be explored in more detail later in the project, and which may need to be addressed using cues to draw attention back to the prompts as required without distracting from the task or being intrusive.

IV. CONCLUSIONS

The method described in this paper has provided a rich source of data to allow objective comparison between types of prompt format, and to explore the design requirements of self-forwarding and how to ensure that the person with dementia knows that support is available without distracting from the task.

Initial findings indicate that text and audio prompts are each effective at prompting a person with dementia to carry out a step within a task, and that picture and video formats are less effective when used in isolation. Some types of action may be better suited to some formats of prompt, and combining some types of prompts together should be explored further.

There is strong potential for enabling the person with dementia to control the provision of the prompts and progress through the task at their own pace using touchscreens and perhaps other methods, and this will be explored further.

The findings will be drawn together into prototype pieces of technology as the project progresses, after making use of mockups and flexible screen displays, with a view to producing a device which can be customized to suit different individuals and tasks.

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