Can Ubiquitous Devices Utilising Reminiscence Therapy be Used to Promote Well-being in Dementia Patients? An Exploratory Study

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Abstract. This exploratory study aimed to assess whether ubiquitous devices could be used to facilitate person-centred reminiscence therapy. In order to test this approach to delivering a reminiscence therapy intervention, a tablet application was designed (using participatory design) and tested by the carers of people with dementia. The study showed that there is the potential to utilise the recent advances in mobile technology to facilitate reminiscence therapy. However, it did not provide conclusive proof that the device would be effective in its delivery of reminiscence therapy, but further research will aim to explore this.

Keywords: Dementia, Reminiscence Therapy, Ubiquitous Devices.

1 Introduction

The aim of this study was to establish whether a mobile application could be used to facilitate personalised reminiscence therapy within the home environment by people with dementia and their carers.

Dementia is a devastating progressive disease. It is characterised by symptoms, including memory loss, mood changes and problems with reasoning and communication [1]. Current estimates suggest that over 800,000 people in the UK are living with dementia, with this figure set to exceed one million by 2021 [2].

With a rapidly increasing population of people with dementia and no cure on the horizon, steps need to be taken to try and manage the symptoms associated with the condition. Reminiscence therapy has the potential to do exactly that. By focusing on the early memories of an individual, it can help to create a sense of self, improve communication, improve one's mood and promote well-being [3].

1.1 Dementia

The main cause of dementia is damage to the brain, either due to certain diseases or a series of mini-strokes. There are four main types of dementia: Alzheimer's Disease,

Vascular Dementia, Dementia with Lewy Bodies and Fronto-temporal Dementia. Alzheimer's disease is the most common form of dementia, with 62% of people being diagnosed with this form [2].

Despite extensive research, there is currently no cure for dementia. Medications can be prescribed to people with Alzheimer's disease in order to slow the progression of the disease or temporarily alleviate the symptoms. However, these are only effective for a limited period of time (normally between six months and a year) [4].

It is estimated that between 80% and 90% of people with dementia present with neuropsychiatric symptoms, including depression, apathy and irritability [5]. Although medication can be used to mitigate these symptoms of dementia, they should only be used in extreme cases. The National Institute for Clinical Excellence (NICE) recommends investigating alternative interventions and using medication as a last resort [6].

Due to the growing number of people being diagnosed with dementia, the need to provide high quality person-centred mental health care aimed at mitigating some of the associated symptoms has become a critical issue.

1.2 Reminiscence Therapy

Reminiscence therapy is one type of intervention which is often used as a "simple non-drug treatment" in order to mitigate some of the neuropsychiatric symptoms associated with dementia [6].

Reminiscence therapy utilises tangible prompts as a way of promoting conversation about shared past experiences, activities and events [3]. These prompts can include photos, music, archive recordings, newspaper clippings and anything else which can be used to stimulate memories. It has been described as "one of the most popular psychosocial interventions in dementia care" which is "highly rated by staff and participants" [3] and research has suggested that it can have positive effects on the participants [3, 7-10]. However, these results are yet to be conclusively established, using robust and unbiased evaluation techniques. In addition to this, Cohen-Mansfield et-Al. [9], suggest that participants are more involved and engaged with reminiscence therapy when the subject matter is personalised to them.

Reminiscence can provide the person with dementia the opportunity to reconstruct memories gained throughout life and provide a stabilising function. It can also be used to help the primary care-giver remember the person as they used to be before the dementia took hold. It can extend the carer's knowledge of the background, achievements and personality of the person they are caring for, which could eventually result in an improved person-centred care plan.

The diagnosis of dementia often causes the person to look at their failings. By focusing on the early memories, which remain intact for longer, reminiscence therapy is able to focus on the person's strengths. It reduces the likelihood of failing to remember and thus can provide reassurance in light of decreasing capacity to retain recent memories. In addition to the positive (and in some cases pleasurable) emotions felt, the person with dementia also experiences improved communication skills and can confidently discuss their earlier memories [7].

Reminiscence therapy also has the potential to help people with "other mental health conditions where depression and general low mood are common" [11]. With waiting lists of up to two years for some talking therapies [12], ubiquitous devices implementing reminiscence therapy could provide an important self-soothing function for people with mental health problems.

1.3 The Use of Ubiquitous Devices

With their increased capacity and improved portability, ubiquitous devices have the potential to facilitate personalised reminiscence therapy.

Currently, reminiscence therapy is performed as a group activity using generic memory prompts. Preparation is a time-consuming process as facilitators must generate a theme for the week and gather relevant materials [13]. Reminiscence is rarely carried out as a one-to-one activity using personal memorabilia. In utilising the power of ubiquitous devices, reminiscence therapy could become person-centred through the use of the individual's own photos, thus enhancing the participant's interaction.

Research by Alm et al. [14], has shown that people with dementia are able to adapt to and interact with touch screen environments. With this in mind, a tablet PC could be used to provide mobility to the users, enabling reminiscence therapy to become an activity which can occur whenever and wherever it is appropriate and convenient.

2 Method

This study was approached from a user-centred perspective, with the carers of people with dementia included at all stages of the design process. It was split into four phases: an initial study, application design, a prototyping session and finally user testing.

2.1 Initial Study

The initial study aimed to assess the perceived nature of reminiscence therapy, identify the types of prompt which evoke memories for both the person with dementia and their carer and also identify usability issues experienced whilst using a computer or touch screen device.

Originally, the initial study was designed to be a focus group involving six carers over the age of 65, who were approached a week before the intervention. However, one participant was due to be away on the planned date for the focus group, but was keen to take part. This led to five participants taking part in the focus group and one interview.

Both the focus group and the interview were semi-structured, with a standard list of questions, enabling the possibility of modification to questions or to include supplementary enquiries for clarification. It also meant that should the participants feel that they were unable to answer some of the questions; these could either be missed out or rephrased.

2.2 Application Design

The application was designed based on the findings of a literature review together with additional information gained as part of the initial study. These designs were then evaluated by carers of people with dementia as part of the prototyping session.

2.3 Prototyping

Initially, two prototyping sessions were planned: a low-fidelity prototype session using paper-based designs and a high-fidelity session which employed the ubiquitous device. However, during the initial focus group, it came across that the carers of people with dementia were struggling to envisage the application. For this reason, it was decided that only high-fidelity prototyping should be carried out. This would allow the potential users to assess the actual usability of the application.

Five potential users were given a set of tasks to carry out as part of the prototyping session. These activities were designed to test all the possible ways the user could interact with the system. The users were observed as they completed the tasks, with any problems encountered recorded. On completion of the activities, the carers were encouraged to discuss their opinions of the system, together with any changes they felt would be beneficial.

2.4 User Testing

This phase of the study was designed to evaluate the perceived effectiveness of the application. Two potential system users, who both have extensive experience of caring for a person with dementia, were used to assess the system.

Similarly to the prototype testing, the user testing involved the completion of several tasks aimed at testing the basic functionality. They were also designed to ensure that the users had interacted with the system sufficiently to form an opinion on the feasibility of utilising the application to facilitate reminiscence therapy. During the testing session, the users were observed to determine whether there were any problems with interaction. Subsequent to the testing session, the carers were interviewed to allow them to discuss their thoughts of the system.

3 Results

3.1 Initial Study

Whilst the participants of the focus group felt that reminiscence therapy would have no effect on their partners at the current point in time, they did believe that it would have been beneficial at an earlier stage of the illness. By contrast, the interviewee considered reminiscence therapy to be useful at the point of execution, but felt it had no lasting effect on her partner.

During the focus group it became apparent that the carers had the perception that reminiscence therapy can only be done as part of a group session, for a specific

amount of time. Although reminiscence therapy is often carried out as part of a group following a set 'prescription', it can be just two people remembering their past together at home. It follows that for the application to be useful the carer's preconceptions of reminiscence therapy need to be challenged and changed.

One couple had participated in a 12-week programme of group reminiscence therapy several years ago. The carer felt that her husband did enjoy the group and "came to life" during the sessions. She also commented that despite his worsening condition, music still provokes memories, with him often able to remember the words to songs from an earlier age.

It was generally agreed by the focus group that music effectively evoked memories for both the carer and the person with dementia. One carer stated that she has CDs containing old music which reminds them of when they first met and revives memories for her husband. The group did agree that photos do stir up memories; however, they were often inaccurate, for example, a person mistaking his grandchildren for his children. This caused the carers frustration, especially when their partners seem able to remember incorrect memories over actual recollections. In addition to this, the participants expressed that taking part in discussions prompted further memories, much like a spider-web fanning out. One participant found that her husband could clearly remember poems from when he was younger. Finally, they felt that there were times when a word would stimulate memories, the example given being "mardy" which reminded the participant of her northern upbringing.

Of the six participants only one person had previously used a tablet PC. He found that his wife became visibly distressed when he used a laptop computer. However, she appears to be unaffected by him using a tablet PC. An observation of the interviewee whilst using the tablet PC showed that she had considerable trouble when using the "pinch-zoom" functionality. This will need to be considered during the design process.

3.2 Application Design

Designing an application for use by people with dementia needs to consider not only the effects of the condition, but also the changes which naturally occur as a person ages. In addition to this, as a group of people ages, their individual needs become increasingly diverse [15].

Due to the declining short term memory of people with dementia, the application has been designed to reduce the volume of information which needs to be remembered. For example, if the user wants to change an item or remove it completely they are able to do this directly from the reminiscence screen. This eliminates the need to remember which item they intended to alter whilst changing their location in the application.

Often, mobile devices will have too much functionality [16]. This leads to increased cognitive load due to the complexity, however when it comes to older users, it is desirable to reduce the amount of effort placed on the brain, as this capacity is in decline. This is even more important for people with dementia whose cognitive skills will be dramatically reduced when compared to someone who does not suffer from

the condition. By simplifying the functionality on each screen and increasing the size of elements, the cognitive load is reduced and the users will not be overwhelmed by the number of possible operations available to them [17]. It is however, important to remember not to simplify the navigation too much. By cutting the number of menu items shown on a screen to just one item, more harm may be done than good. It will stop the users from seeing the alternatives and will also hide the navigation structure from them [16].

In addition to this, as a person grows older there is a natural decline in their ability to extract relevant information in a field of distractors [18]. This is particularly important when trying to facilitate reminiscence therapy, as the focus should be on the memory prompt rather than the interface. Therefore, to avoid distractions, the interface has been designed to be as simple as possible, bearing in mind the dangers of over-simplification mentioned above. This ensures that the person with dementia focuses on the reminiscence item rather than the interface, promoting enhanced interaction with the process.

In order to maximise the readability of the interface, designers need to consider the colour of the background in relation to the foreground text. Research suggests that there should be a high contrast between background and foreground colours [19]. It is suggested that the best colours to use are black text on a white background [18]. However, Lorenz & Oppermann [20] agree that whilst the readability is best with the black text, white background combination, their users commented that the white background was too bright and made them uncomfortable. This led them to propose a grey or orange background with black, white or turquoise fonts. In this application, a white background has been chosen to maximise readability. However, to combat the discomfort caused by the harsh background, the interface components will be made as large as possible, without compromising the flow of the interface. This will allow the text size to be made as large as possible, which agrees with the suggestions made by Dickinson et al. [19].

The application allowed the users to link music and images together, in order to provide the potential for dual stimulation of memories. In addition to this, the users were able to name their memories and provide extra notes to act as supplementary memory prompts.

Figure 1 shows the interface for the main reminiscence screen. It provides all the functionality required to facilitate reminiscence therapy. In order to maintain the consistency of the layout when there is no music assigned to an item, the play, pause and restart buttons will be hidden allowing for no change in the positioning of the subsequent buttons. This will remove any frustration felt from buttons which appear to have no functionality, without requiring the users to search for buttons that are in different positions.

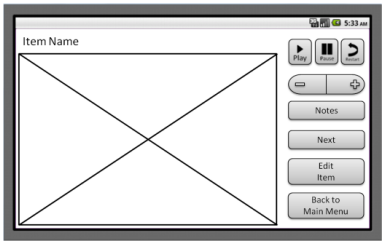

Fig. 1. Reminiscence screen

3.3 Prototyping

In general, the users felt that the system was easy to use. The prototyping session provided an insight into the problems which could be encountered by the users allowing adjustments to be made to the system in order to eliminate these issues.

The main issue identified by all the participants in the prototyping session was the colour scheme. Contrary to the findings of the literature review, they did not have a problem with the brightness of the white background; instead they felt that it was a "boring" colour scheme. The carers were encouraged to suggest the colours they would particularly like to see in the interface. The majority stated that calming pastel colours (such as light yellow or purple) would be the ideal option, as they would make the interface appear "cheerful".

The users struggled to identify the zoom buttons in the interface. Therefore by adding a label to the zoom buttons, this would allow the users to quickly identify their use. They did, however, like the ability to zoom into images as it enabled them to see additional detail which had been overlooked. This feature allowed the carer to emphasis parts of a photo to the person with dementia, such as the face of a loved one. The main reminiscence screen was adapted to take this suggestion into account, see figure 2.

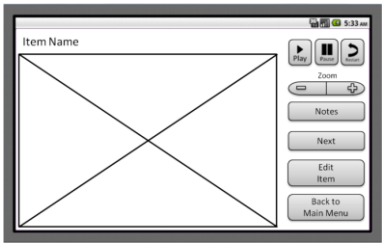

Fig. 2. Updated Reminiscence screen to reflect the labelled zoom button.

All the participants had problems reading the notes before they disappeared from view. They quickly realised that if they kept pressing the notes button, the pop-up remained visible for longer. This is not an ideal solution; therefore, in the final system the length of time the pop-up remained on the screen needed to be increased.

When adding and changing items, the users struggled to decide which button related to each section of the interface. For example, the participants couldn't decide which button added an image. It was suggested that this problem would be eliminated by switching the position of the button with the text field (in the case of the music) and the image preview (for the photo). This made the associations clearer to the user.

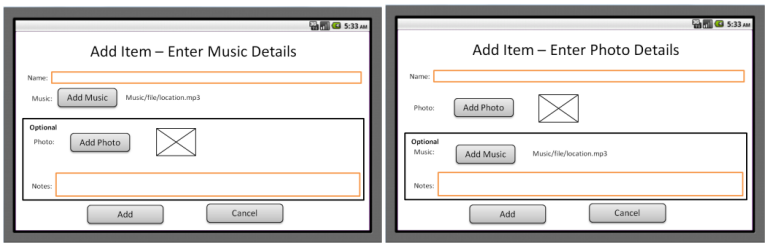

Fig. 3. Updated Add Music and Add Photo screens

3.4 User Testing

Both testers felt that the application would be beneficial to them for facilitating reminiscence therapy with their respective relatives. They commented that a large number of their photographs are already saved on their personal computer, and as such would be easy to transfer.

One tester commented that the initial input of personal memories would be extremely time consuming and quite difficult using the Android keyboard. However, after the first series of memories had been entered, it would simply be a case of maintaining the database and adding extra memories when necessary. Conversely, the other tester felt that the input process would provide an additional opportunity to reminisce, allowing input from the person with dementia, which could result in a more comprehensive set of memory prompts.

When asked to zoom in on an image, both users approached the task differently. One tester decided to use the buttons included on the interface, whereas the other user automatically exploited the pinch-zoom functionality. This justified the inclusion of both methods of enlarging the picture in order to reduce unassisted recall.

One user found it frustrating that having pressed the next button the ability to return to the previous image was absent. This was perpetuated by the buttons being situated in close proximity, as the user found it easy to accidentally press the adjacent button when intending to display the photo notes.

The testers felt the background colour scheme used had an overall calming effect. The testers commented that the background colour did not detract from the purpose of the screen, ensuring that the focus was maintained on the reminiscence item rather than the surroundings. Despite this, care needs to be exercised when concluding that the colours are appropriate, due to the variety of the potential users' visual needs.

Despite increasing the amount of time available for the notes to be displayed on the screen, both users still found difficulty in reading the entire contents of the pop-up before it disappeared. This suggests that either there needs to be an improved method of displaying the notes on the screen or the length of time that the pop-up is displayed

should be increased further. The latter is possible; however, there is the risk that there will always be someone who reads the pop-up slower than others.

4 Conclusion

This study aimed to assess whether ubiquitous devices are a practical method for facilitating reminiscence therapy for people with dementia and their carers. Whilst this study does not categorically prove that ubiquitous devices are effective in delivering a reminiscence therapy intervention, it does show the potential. The prototyping stage increased the interest of carers in the application, as they were able to foresee the possible advantages of using a ubiquitous device to facilitate reminiscence therapy.

The initial study found that some carers are averse to trying new methods of stimulating their partners' memories. This is not due to a lack of commitment, but to the opinion that arguably there will be no positive effect so "there will be no point in trying". There also appears to be a belief that reminiscence therapy can only take place in a group, for a set period of time. This assumption needs to be challenged, as reminiscence can occur at any time.

Should reminiscence therapy be adopted during the earlier stages of dementia, a routine may be instilled which enables both the person with dementia and the carer to benefit from the recollection of shared memories. By developing the catalogue together, whilst their treasured memories remain intact, allows for increased participation. The burden of creating and maintaining the flow of conversation during reminiscence on the carer will be reduced [13].

Future research will investigate whether the application is designed sufficiently to be used by people with dementia. Once this has been established, the application will be tested to investigate whether it has a measurable effect on the well-being of people with dementia and their carers. In addition to establishing the use of ubiquitous devices to facilitate reminiscence therapy for people with dementia and their carers, further research will be completed to investigate use with other user groups (such as people with depression, borderline personality disorders and other mental health problems).

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