



Does familiarity affect the enjoyment of touchscreen games for people with dementia?



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ABSTRACT

Introduction: Previous research has indicated that people living with dementia are able to use touchscreen technology, which presents an opportunity to deliver meaningful and engaging activities for people to pass the time independently. The challenge is to identify suitable applications from the thousands that are currently available, and familiarity, where an app is a digital version of an existing real world game, may be one solution.

Objectives: To evaluate the concept of familiarity in gameplay with people living with dementia by comparing a known game with a novel game and measuring whether users are able to play these games independently and whether they enjoy doing so.

Methods: Thirty older adults living with dementia were recruited from local care services. Each participant was assigned to one of two groups. Group 1 played a familiar game (Solitaire) and Group 2 played a novel game (Bubble Xplode). Each participant played the same game on three separate occasions within one week. Number of gameplay attempts, whether a checkpoint was reached and how much time to reach the checkpoint were measured. A brief post-session interview was conducted to assess the participants' enjoyment.

Results: Ninety percent of participants attempted gameplay independently with 17% of participants in the familiar group reaching the checkpoint compared with 93% playing the novel game. Regardless of which game was played or whether the checkpoint was reached, 88% of all participants reported enjoyment of the gaming sessions.

Discussion: People living with dementia can play touchscreen games independently, but familiarity does not ensure successful gameplay. Enjoyment appears to be independent of progression through a game. The potential of novel and unfamiliar games as meaningful activities that people with dementia can engage with independently should be further explored.

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1. Introduction

Dementia is an incurable, progressive neurological condition that currently affects an estimated 44.4 million people worldwide, and is predicted to rise to over 75 million by 2030 [1]. Dementia primarily affects cognitive functions, such as memory, language, attention, planning and initiating activities, which affects a person's abilities to look after and occupy him or herself. This places huge demands on families who provide the majority of dementia care

[2], but also on health and social care services, which are increasingly stretched in trying to accommodate the growing numbers of older people with dementia [3].

Currently there is a lack of satisfying and enjoyable activities for people with dementia to pass the time in a meaningful way that does not place huge demands on caregivers [4]. Identifying independent activities for people with dementia that are both stimulating and safe would benefit both the individual and their caregivers [5]. Touchscreen devices, such as smartphones and tablets are increasingly available, affordable and accessible [6] and there is growing evidence that people with dementia are able to use them [7–9]. In the majority of examples to date where touchscreen technology has been used with people with dementia, the

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function has been either to present cognitive assessments [10–13] or to provide cognitive support or stimulation [14–17]. Whilst these functions are obviously beneficial, these devices also have the potential for providing activities for people with dementia to engage with and enjoy independently [18], and this is an area that is currently under-researched.

Where touchscreen interfaces have been used with people with dementia for entertainment purposes, it has been identified that activities that require constant interaction and an element of challenge can hold the user's attention and be enjoyable [5]. Here the importance of aesthetic design was highlighted as a contributor to the sustainment of the user's attention. The researchers addressed this by involving people with dementia and their carers throughout the development process; testing the various designs and making alterations iteratively based on observations and feedback. This work, along with more recent projects [19,20], focussed on the development of original touchscreen games designed specifically for people with dementia. Whilst the advantages of this method are clear, there could also be value in looking at existing touchscreen applications (apps) that have not been designed specifically for people with cognitive impairment. The potential benefits are that there is a vast range of choice already available and by utilising apps that are available to the wider population, any risk of stigma is reduced [21]. These two approaches (bespoke and 'off-the-shelf') need not be considered mutually exclusive as any outcomes learned from one can serve to benefit the other. Evidence for this can be found in similar work involving the development of games for older adults without dementia or cognitive impairment, where existing games were used initially to collect design recommendations [22]. If suitable 'off-the-shelf' games could be identified for people living with dementia, and a model for selecting them be developed, this could provide users with a greater variety of choice whilst reducing the possibility of stigmatisation, and potentially inform the development of new games in the future.

An evaluation of available iPad applications carried out in 2012 offered people living with dementia a choice of ten touchscreen applications classified into two types: 'competitive games' (e.g. 'Checkers') and 'sensory activities' (e.g. 'Pocket Pond'). [23]. The research, conducted in the Netherlands, had a researcher either sitting with or nearby the participants to help them navigate the iPad. One app, 'Sjoelen' ('Shuffleboard'), was by far the most popular, accounting for 76.83% of the 82 selections, with the second most popular accounting for only 23%. Sjoelen is a representation of a popular Dutch board game [24] that requires players to slide pucks along a playing board into any of four compartments that carry point values of one to four. The application's title and icon, and the design of the board and playing pieces, are accurate to the original real-world game, which may have provided the necessary cues for the participants to recognise the game. The finding that people living with dementia consistently chose this game suggests that familiarity with the 'physical' version of the game could have influenced the participants' selection. However, because the participants were free to choose which application they used, it is not known whether familiarity had an effect on their ability to use the application or how much they enjoyed using it, compared with unfamiliar applications.

The current study therefore investigated the effect of familiarity on usability and enjoyment by people with dementia, focusing on apps identified as games (as opposed to sensory experiences). A series of selection parameters were developed on which to base decisions about the selections of apps, influenced by the findings of the previous Dutch study and previous work developing interactive activities for people living with dementia [25]. These criteria were used to select two games designed for individual play that were deemed accessible and user-friendly—one 'familiar' (a well known one-player card game) and one 'novel' (a tile matching game). The

research questions were: 1. Are people living with dementia able to play games on the iPad independently (without a researcher or caregiver on hand)? Specifically, (a) Does the familiarity of the game affect their ability to play it on the iPad? and (b) Are they able to learn and improve their performance on the game over time? 2. Do people living with dementia enjoy playing games on the iPad independently? Specifically, (a) Does the familiarity of the game affect their enjoyment of it? and (b) Does their level of enjoyment change over time?

2. Method

2.1. Design

A 2 (groups) X 3 (time) mixed design was used. Thirty participants were recruited and randomly assigned to one of two groups: Group 1 played the familiar game and Group 2 played the novel game. Each participant was asked to play the same game at three different time points over the course of a five-day period.

2.2. Participants

Thirty people living with dementia were recruited from residential, specialist dementia and day care services. Twenty-five of the participants were female and five were male. Their median age was 86 (range 78–100; SD 5.34). The severity of their cognitive impairment was assessed using the Montreal Cognitive Assessment (MoCA) [26] with a score of <21 required to meet the criteria for dementia. The participants' mean score on the MoCA was 13.4 out of 30 (range 8–21; SD 3).

The study received a favourable ethical opinion from the School of Health And Related Research (SchARR) Ethics Committee at The University of Sheffield. A member of the research team obtained consent from each participant. Members of staff from the care services supported the consent process as gatekeepers by identifying potential participants and providing them with an information sheet. The researcher only approached individuals if they were agreeable to finding out more information about the study. Those who consented were visited individually within their care service and the study was explained to them in full. A member of the research team assessed each person's capacity to consent to participate in the research based on the criteria set out in the Mental Capacity Act 2005 (England & Wales) [27] and following recommended guidelines published by the British Psychological Society [28]. On receiving verbal consent to take part in the study and with satisfaction that the person had the capacity to make this decision, signed consent was obtained by the individual. As decisions are time-specific, the researcher reviewed this procedure at every point of contact with each participant. All participants were made aware that they were free to leave the study at any time. The input of relatives was not required as the participants retained the capacity to consent to participate, however it was agreed with the service managers and participants that relatives would be informed that the study was taking place.

2.3. Materials

2.3.1. Games

2.3.1.1. Familiar game. In selecting a familiar game, an app was sought that was a digitised version of an existing game that is sufficiently popular to have a high chance of being known to the target population (in the UK). 'Solitaire' (or 'Patience') is a one-player card game that has been played in England since the late 19th century [29] and that saw an increase in popularity during the 1980s through its inclusion on personal computers [30]. The decision by Microsoft to include a version of the game as preloaded

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