

# **Does digital gaming enable healthy ageing for community dwelling people with dementia?**

## **Introduction**

This paper critically assesses the benefits of digital gaming technology available ‘off-the-shelf’ to support the healthy ageing and independence of people living with dementia in their community. People with dementia have been classed as a vulnerable population (MCA 2005) and their numbers are predicted to rise from 44.35 million in 2013 to 75.62 million in 2030 and 135.46 million by 2050 (ADI 2013). In 2010 the numbers of people with dementia were estimated to cost the worldwide economy \$604 billion (WHO 2012) and this will only increase as this population continues to grow. In the UK it is estimated that around 850,000 people are living with dementia, 720,000 in England (Alzheimer’s Society 2014b). This is likely to cost the UK around £26 billion a year in care costs and lost productivity (Alzheimer’s Society 2014b). With the lack of a silver bullet cure and faced with these stark figures it is unsurprising there has been an increased global focus on supporting and helping people with dementia to live well at home for longer, particularly as two thirds of people with dementia in the UK reside in the community (Alzheimer’s Society 2014a). The World Health Organisation (WHO 2012) and the 2013 G8 Dementia summit (DoH 2013) places dementia as a global health priority while the English National Dementia Strategy (DoH 2009) and the subsequent Prime Ministers Challenge (DoH 2012) and dementia friendly communities initiatives (DoH 2012, Alzheimer’s Society 2013a) have ensured that dementia has received national recognition.

Living with dementia poses particular challenges for the Health Ageing Agenda. Healthy ageing for the general older population has been defined as:

*“A process of optimising opportunities for physical, social and mental health to enable older people to take an active part in society without discrimination and to enjoy an independent and good quality of life.” (SNIPHR 2006: page 8)*

This approach is supported in the dementia field where the importance of maintaining and enhancing wellbeing whilst living with dementia by keeping physically, socially and mentally active has been recognised (Hall et al 2009; Hill et al 2010; Wang et al 2012; Swann 2012). Activities promoting engagement and well-being may help to reduce the risk of dependence, further health deterioration and social exclusion for those living with dementia (Innes 2009). English policy directives (DoH 2009, 2012) support research findings, for example initiatives designed to raise societal awareness of dementia (Alzheimer Society 2013a) and to reduce social isolation experienced when diagnosed with the condition (Alzheimer’s Society 2013b).

Lifelong learning refers to an on-going process of learning throughout one’s lifetime in different environments that can contribute to personal fulfilment, active citizenship, social inclusion and employability/adaptability (The European Commission 2001: 9); and is therefore an important element of healthy ageing. Research suggests that lifelong learning may be a protective factor for developing dementia (Foresight 2008) but it is also beneficial for the well-being of those living with the condition. For instance the Scottish Charter advocates the right for people with dementia to access opportunities for community education and lifelong learning for purposes of empowerment and well-being (Alzheimer Scotland 2009).

Whilst healthy ageing is an admirable ideological aspiration to apply to people with dementia it can be difficult to achieve. Recent Alzheimer’s Society research (2014b) showed that 61% of people with dementia in the UK feel anxious or depressed, 40% feel lonely and 34% do not feel part of their community. This in part can be attributed to a lack of services for people

with dementia but also to the ‘jeopardy’ (Innes 2003; Benbow and Reynolds 2000; Bowes and Wilkinson 2002), people with dementia may face. Multiple jeopardies (Innes, 2003) including, ethnicity, gender, class, sexual orientation and physical disability lead to various forms of discrimination and the marginalisation of people with dementia. The label dementia carries with it a stigma, referred to by Goffman (1963: 3) as an “attribute that is deeply discrediting” and that reduces the bearer “from a whole and usual person to a tainted, discounted one.” Research has shown that people with dementia are stigmatised and discriminated against (Benbow and Jolley 2012; Milne 2010). This stigma weakens people’s sense of self-worth and self-esteem whilst increasing their sense of being burdensome (Sabat 2010). This may create barriers to accessing services which are designed to support their healthy ageing or enable them to play an active role in wider society. Bartlett and O’Connor (2010) discuss the concept of ‘social citizenship’ to illustrate how society can impede people with dementia from upholding their basic rights as a citizen bestowed upon them by the state, including accessing health and social services and being socially active and connected to others. This often impacts detrimentally on their well-being and healthy ageing by further adding to their social exclusion and marginalisation (Innes et al 2004, Gilmour and Brannelly 2010). It is vital that people with dementia are supported to successfully achieve healthy ageing; this requires promoting public awareness and understanding to challenge on-going misconceptions and stigma of dementia reported globally (ADI 2012).

### *Psychosocial interventions and living well with dementia in the community*

National Institute for Health and Clinical Excellence (NICE) and Social Care Institute for Excellence (SCIE) (2006) guidelines argue for the reduction of pharmacological interventions in dementia care. Psychosocial interventions offer an alternative way to support people with dementia to live independently for longer and are now acknowledged as a core element of dementia care research (Moniz-Cook et al, 2008; Moniz-Cook et al 2011; Orrell 2012).

Indeed it has been reported that psychosocial interventions can be as effective as pharmacological treatments (Olazaran et al, 2010).

Benefits of community psychosocial interventions align well with the ideological aim of healthy ageing. These have included: reducing depression, and improving Quality of Life and self-esteem (Leung, 2015); slowing the progression of dementia and reducing symptoms associated with the condition (McLaren 2013; Wang et al, 2010); enhancing memory (Zarit et al 2004); positively impacting on sociability, emotional adaptation, mood and behaviour (Choi et al, 2009; Camic et al, 2013, 2014; Rusted et al 2006) and; improving balance and independence (Campbell et al 2010). Counselling and family support programmes have also been linked to delays in nursing home placement (Andren 2008; Mittelman et al 2006; Spijker et al 2008). It has been argued that delaying admission to long term care is one reason why psychosocial interventions are a cost effective approach to providing care for those living with dementia (Aguirre et al 2014). Therefore adopting a psychosocial approach can directly benefit a community-dwelling person with dementia and contribute to achieving the aims of a health ageing agenda while reducing societal economic burden.

#### *Living well with dementia using digital gaming technology*

Technology can support the well-being of people living with dementia in the community (Mulvenna et al 2010). However most research has focussed primarily on using technology to promote safety and security for people with dementia and their informal carers (Lauriks et al 2007; Riikonen et al 2010; Span et al 2013). Astell (2013) has argued that this has unduly influenced the direction of technology research and consequently other areas of well-being have been neglected. Dementia-specific technology, such as Computer Interactive Reminiscence and Communication Aid (CIRCA) (Alm et al 2009) or Cogknow (Meiland

2007) demonstrates additional health benefits for people with dementia including improved communication and heightened mood and sense of well-being through reminiscence activities. It has been argued that specifically designed technology may be more suitable than commercially produced technology for people living with dementia (Astell 2013). However the limited research exploring off the shelf technologies such as the Wii and iPad suggests health benefits for people with dementia living in the community (Fenney and Lee 2010; Leahey and Singleton 2011) and those residing in Assisted Living and nursing home environments (Chao et al 2013; Leng et al 2013; Padala et al 2012; Tobiasson et al 2010; Ulbrecht et al 2012; Upton et al 2011). Reported benefits include; improvement in scores and in the maintenance of procedural memory for the games (Fenney and Lee 2010; Leahey and Singleton 2011); transferability of learned skills to other leisure activities (Leahey and Singleton 2011); improvement in balance on the Wii Balance Board and fitness games (Chao et al 2013; Padala et al 2012); improvement in communication with informal and formal carers as well as fostering intergenerational communication and supporting activities of daily living (Upton et al 2011) and; general enhancement in social interaction and well-being through engaging with fun games and applications (Fenney and Lee 2010; Leng et al 2013; Padala et al 2012; Tobiasson 2010; Upton et al 2011). If technology is to be used routinely within the community it is imperative that it is affordable, user-friendly and widely available.

The limited research, conducted primarily in care home settings, suggests that digital gaming may provide a way to promote learning and mental, social and physical wellbeing for people with dementia; all are integral to the Healthy Ageing Agenda. This paper contributes to the growing evidence base on the potential benefits of digital gaming technologies for those living with dementia in the community.

## **Study Design**

Between September 2012 and May 2014, a total of 26 technology sessions, referred to as 'Tech Clubs' (commissioned by a local council) were delivered to 29 community-dwelling people with dementia between the ages of 65-80 years old. The Tech Clubs were hosted in four accessible venues; all had Wi-Fi access and a large screen. Sessions were scheduled over a two hour period and ran for six to eight weeks in an English town. Groups had between three and ten participants (table one).

This study aimed to capture the experiences and views of using digital gaming from people living with dementia. This approach reflects the emphasis in the literature of including the voices of people with dementia in research, (Cowdell 2008; Dewing 2008; Downs 1997; Goldsmith 1996; McKeown et al 2010; Murphy et al 2014; Wilkinson 2002), with the aim of working collaboratively with participants (Bradbury and Reason 2003) in a way that responds to individual personalities, needs and values as advocated by person centred approaches (McCormack 2004; Brooker 2004). This project followed principles of participatory action research (Chevalier and Buckles 2013) by adapting sessions to meet the interests of the participants.

### *Tech Club Structure*

Each session was led by two facilitators, using a range of software, games and apps for the Nintendo DS, Nintendo Wii and Apple iPad. As a starting point, the sessions concentrated on providing basic information and instruction for the chosen pieces of equipment and

associated games and apps (Cutler et al, 2013). Repeat visual and verbal demonstrations were offered as required.

### *Methods*

A mixed-method approach (Bryman 2008) captured the views and experiences of the participants. Three methods were used: ethnographic field notes (Holloway and Wheeler 2010) to record participant engagement and interaction with the digital gaming equipment; participant and carers self-complete questionnaires (Bryman 2012); and focus group style discussions (Kitzinger 1995) at the end of each session following a natural conversation approach to generate feedback (Flick 2014).

### *Ethics*

Ethical approval was obtained from the University Ethics Committee. Information sheets and recruitment posters were distributed by local gatekeepers to potential participants all of whom they judged to have dementia and the ability to give informed consent.

Consent forms confirming awareness of voluntary participation, withdrawal at any time and confidentiality and anonymity principles were completed by each participant, and discussed verbally where required. Process consent methods (Dewing 2008) including responding to nonverbal cues of a wish to withdraw were followed during each session. A weekly registration form was used to remind participants that they were part of a study.

### *Data Analysis*

Data was analysed thematically using NVivo9 for data management purposes. A coding framework (Bryman 2008) was developed by one researcher and verified by another to enhance the authenticity of the analysis. Table two provides details of the group and participant identifier codes in the findings that follow. Formal carers (FC) are paid care workers. Informal carers (IC) are care partners (family or friend) who attended the sessions with the participants.

## **Findings**

Three distinct themes relating to the benefits of digital gaming to promote healthy ageing and independence of people living with dementia emerged: promoting lifelong learning; optimising mental, physical and social stimulation; and independence. These are discussed and then brought together under the overarching theme of promoting healthy ageing.

### **Promoting Lifelong learning**

The use of digital gaming technology supports the concept of lifelong learning as it enables participants to develop, maintain and enhance their skills and knowledge. This is an important part of healthy ageing as it promotes the need for continual learning and engagement in new meaningful activities.

#### *Learning agendas*

Most participants had never seen or used digital gaming technology. The exception was the iPad which was more commonly recognised amongst participants in two of the groups (TC2 and TC4). Despite unfamiliarity with the gaming technology, all participants were interested

in learning how to use them. Participants in three groups (2, 3, 4) held individual learning agendas, in particular how to use the iPad and the Nintendo DS;

*'I want to learn more on the iPad.'* TC3PWD(17) (FG)

*'I'm hoping to learn more next week about the iPad.'* TC2PWD(12) (FG)

TC2PWD(11) *brought his own DS along to the session to be shown how to use it.* (FN)

TC4PWD(26) *commented when asked is there anything in particular you would like to learn, 'it's all new and I like learning new things, I would like to be shown how to use more of the iPad.'* (FN)

Interestingly, whilst the sessions concentrated on providing the basic information and instruction for the selected gaming technologies and associated games and apps, three participants wanted to learn additional aspects of using the iPad beyond the explanation provided. They wanted to learn how to physically handle the iPad, how to use it to communicate with family and friends, and how to add applications to access their hobbies and interests;

*'How do you turn the screen?'*... *'How can you talk to people?'*... *'Can you download Google Earth at home?'* TC4PWD(27) (FN)

TC2PWD(12) *started to ask questions surrounding other features of the game and about how you can change the direction of the bowling ball.*

TC2PWD(13) *enquired into other control features of the game, for example, reverse actions on Mario Kart.* (FN)

Learning to use unfamiliar technologies, games and apps provided participants with a sense of achievement as they had learnt something completely new. This supports the idea of people with dementia engaging in new and meaningful activities to benefit well-being (Phinney 2007). Participants reported ‘learning’ as one of the most enjoyable aspects of the sessions;

*‘Well you felt you were learning something.’ TC4PWD(24) (FG)*

*‘I learnt things I could never master before...’ TC2PWD(11) (SQ)*

Whilst it is apparent that learning was an enjoyable experience, participants reported that the act of learning to use the technologies made them feel that they had physically used their brains;

*‘This gives you a head ache doesn’t it?...I’d like to learn more [in reference to iPad] and know more if my brain can handle it.’ TC3PWD(21) (FN)*

*‘I open up my mind to what’s being taught to me and I can understand it. Sometimes I forget, it’s the understanding of it... I know a lot more about the DS than I ever did... I’ve picked up something that I will hold in my brain I suppose.’ TC2PWD(11) (FG)*

*‘It has fired dad’s enthusiasm for technology. It has given him a new thing to think about and aim for. He would love to learn more.’ TC2IFC(3) (SQ)*

Participants successfully engaging with the technologies was often unexpected and surprising to formal care workers who expected them not to want to or be able to use the technologies;

*'I was surprised the clients could use some of the games on computer.'*

TC3FC(4) (SQ)

*'Yes was quite surprised how clients embraced technology'* TC3FC(5) (SQ)

A desire for continued learning was apparent in the participants, demonstrating that they were both able to and wished to maintain lifelong learning. Learning opportunities were embraced in relation to the technologies and also to the games that required mental and physical engagement.

### *Transferable skills*

Participants of TC2 and TC4 demonstrated a desire to continue their learning beyond their attendance at the sessions. This was extended further by two participants who wanted to transfer their new skills to enable them to reinstate past hobbies and to share their learning with family and friends;

*When provided with a guide to use the iPad, one participant commented 'the presentation of this is very useful and you can work through it at home.'*

TC4PWD(27) (FN)

*A family carer commented that while at home the participant 'wanted to play the memory game that they had in the sessions.'* TC4IFC(7) (FN)

*One participant commented that they wanted to learn how to play the DS to enable them to 'play at home with the grandchildren.'* TC2PWD(11) (FN)

Participants wanted to learn new skills and apply their previous experiences. For example one participant wanted to learn how to use the iPad (due to its perceived similarity to a PC) so that they could transfer their existing skills and knowledge to this new equipment. This demonstrates that the participants were not only capable of learning new concepts but were also able to access and apply past knowledge and skills from one piece of technology to another.

*'You can do the same things that you can do with a computer.'* TC2PWD(13)  
(FN)

The Tech Clubs offered the opportunity to not only use new equipment but to learn and be taught how to use it. All participants were willing to learn, with some having a commitment to continued learning through developing their own clear learning agendas. Our data supports the argument that people with dementia can and want to learn, that learning new complex and intricate skills are possible for this community and that with support people with dementia are able to develop their learning and apply it to other areas of life. Transferability of skills to other leisure activities was also reported by Leahey and Singleton (2011). This challenges assumptions of limited capability of people with dementia and further supports the Scottish Charter (Alzheimer Scotland 2009) argument that people with dementia have a right to lifelong learning.

### **Optimising mental, physical and social stimulation**

Digital gaming technology provided a way to optimise mental stimulation, physical activity and social interaction for participants. All of these are crucial aspects for healthy ageing.

#### *Mental stimulation*

Participants actively engaged with most of the technology for extended periods of time in all the groups. This required high levels of concentration often for thirty minutes or longer to successfully play the games and activities;

*TC2PWD(11) was very involved with the brain training and was concentrating for 1/2hr. (Nintendo DS)... TC2 (FN)*

*The concentration level was high when the activity began and continued until the participants had completed their creation [in reference to iPad]. TC1 (FN)*

*The room was very quiet whilst participants were engaged in their activity. Facilitator stepped back and allowed the participants to use the iPads...This lasted for five minutes. TC4 (FN)*

The technology acted as a medium to engage and mentally stimulate participants. In one group gaming technology was used to paint, draw and take photographs enabling participants to engage in previously mentioned creative hobbies. This highlights the importance of acting on knowledge of participants' interests to tailor the use of the technology. This can be particularly beneficial when first introducing new technology;

*At the beginning of the session it was discovered that both participants (TC2PWD(11) and (12) were artistic and enjoyed arts, crafts and painting. Following from this it was decided that the iPads would be used...to be creative... TC2PWD(11) was very engaged and creative in taking photos of himself, and switching the camera to take photos of the facilitator and carers. TC2PWD(12) wanted to take photos of themselves with their pearl necklace. After seeing TC2PWD(11) taking photos of other people they also wanted to take photos of the carers, TC1G2(2) and co- facilitator. (FN)*

Creating a Mii character on the Nintendo Wii provided participants with an outlet for creative expression. This task required concentration and skill as the participants used their imagination to create a range of characters, many of which were unlike themselves and often of a different sex. The humorous nature of this task helped participants to bond;

*TC2PWD(12) created a male and TC2PWD(11) created a female. This generated much laughter but also demonstrated the participants' playful side and sense of humour...TC2PWD(12) was independent and undeterred in their choices of features, whilst TC2PWD(11) at first was led by others in the group in his decisions. After a while TC2PWD(11) decided which features they preferred. (FN)*

Participants from the other groups commented on the need to use their mental abilities to engage with the digital gaming technology and this was something which appealed to them;

*'...it's alright now because I'm using my brain. Yeah, I like it.'* [in reference to iPad] TC3PWD(21) (FG)

*'I like the way my brain had to work. I am fascinated by my brain.'* [in reference to DS] TC1PWD(2) (FG)

The iPad and Google Earth application were useful digital gaming devices to encourage participants to use their mental abilities. For example, two participants from one Tech Club became noticeably engrossed with the application and began to use investigative skills to explore previous places they had visited or resided in by using their memory to establish familiar landmarks;

*TC2PWD(12) was using investigative skills in trying to find old properties through elimination using memory. Seeing things on Google Earth sparked more memories for TC2PWD(12). TC2PWD(11) was looking at Cyprus and Madeira... using investigative skills to find where they were based in the army and whilst on holiday.(FN)*

Digital gaming technology provides opportunities for mental stimulation, by engaging participants in activities which require them to concentrate and use mental capabilities such as memory.

### *Physical Activity*

The Nintendo Wii and Balance Board required participants to move their body to interact with the games via the motion censored control system. It was evident through comments made and field notes, that most participants were able to undertake the actions required of them (some of which were quite complex) and they enjoyed doing so;

*'I thought that was fantastic...freedom of movement. We don't have to stand there like a stiff dummy, I will show the kids.'* [in reference to Wii]  
TC2PWD(11) (FG)

*As soon as TC1PWD(1) became familiar with the balance board and the game they were more comfortable with the movements required...Facilitator commented 'this is good exercise', participant replied 'of course it is' and was*

*very determined to beat her previous score commenting 'you've got to go faster.'* (FN)

However, participants in two of the groups appeared to find the games which were slower paced with fewer moving graphics easier to engage with and subsequently more enjoyable;

*Participants seemed to respond more to the ice cream game. This may be due to the fact that the ice cream game was slower, less moving graphics and was of a slower, calmer nature.* [in reference to Wii] TC1 (FN)

*'I find Mario Kart too fast for my eyes.'* [in reference to Wii] TC2PWD(11)  
(SQ)

Physically interacting with the digital games had additional benefits for the participants. For example it was noted by an informal carer, that one participant's co-ordination, balance and memory seemed to improve through engaging with the Nintendo Wii;

*'Through activity; better coordination; ability to follow instructions; willingness to be directed; remembering skills: balance improved.'* [in reference to Wii] TC2IFC(2) (SQ)

Participants enjoyed interacting with the Nintendo Wii and the Balance Board. It is interesting to note that when participants were given the choice of sitting or standing to interact with the games they predominantly chose the latter. On occasions it surprised informal and formal carers when they demonstrated the necessary physical abilities to engage with the games. This highlights how digital gaming can be used as a platform for participants to challenge misconceptions of their abilities (discussed further below);

*During all of the Wii games all of the participants choose to stand up whilst playing the game. TC1 and TC3 (FN)*

*It was also noted that all participants stood to do the bowling through choice despite some concerns from their carers. TC2 (FN)*

Digital gaming allowed participants to engage in mild forms of physical exercise by taking part in activities they once enjoyed but were now no longer able to due to physical and/or practical limitations. The intuitive nature of the Nintendo Wii, meant that participants with previous experience of the activity in a real world setting could pick up the actions and movements relatively easily;

*‘When provided with a selection of games to play using the Nintendo Wii balance board, TC2 decided to play the slalom ski game. When TC2PWD(12) started to play this, it was mentioned that this participant frequently used to go skiing on holiday but had not been able to go now for a number of years. (FN) When this participant was later asked what they enjoyed about the session, the participant’s reply was ‘Skiing.’ (FG)*

Having access to different technologies during each session allowed individual participants to pursue their own interests while also being part of a group. More and less physically challenging games provided the opportunity for group members to actively choose games that met their physical abilities. It also meant that if on certain weeks participants were not in the mood to physically engage with movement games they could undertake more sedentary activities and still be part of the group;

*TC3PWD(21) commented ‘I’m tired today, I’ve been tired all week’ declined to play the Wii bowling game and instead opted to engage with the iPad. (FN)*

Digital gaming technology promoted mild physical exercise via fun activities, new and old, with informal carers reporting benefits for the person with dementia's co-ordination and balance. These benefits have also been reported in other studies (Chao et al 2013; Padala et al 2012; Tobiasson et al 2010).

### *Social interaction*

Digital gaming promoted social interaction amongst participants and was particularly important for the development of group cohesion as participants got to know one another whilst learning new games and applications. The digital gaming devices acted as a catalyst for social interaction through two means; either by participants talking about the technology as they engaged with it or; participants talking about topics of conversation introduced and promoted by the use of the technology.

When the technology or games were first introduced to the participants the 'novelty factor' stimulated light hearted conversation as the game and what was required to play was discussed;

*'TC3PWD(23) and TC3PWD(16) were talking to each other about the game and laughing and chatting about their go.'* [in reference to Wii] (FN)

After the iPads were explained to the participants of TC1, TC1PWD(2) commented *'it's amazing what you can do'*, to which TC1PWD(9) replied *'isn't it great, very clever.'* (FN)

Social interaction between the participants suggests that they were mentally stimulated throughout the duration of the game; both when they were playing it and when they were

observing others engagement. Using the equipment can therefore increase social interaction between participants and between participants and their informal carers;

*TC2PWD(11) was teaching TC2PWD(12) how to play chequers on the iPad. They concentrated on the game for 15 minutes. ...As TC2PWD(12) finished their turn and TC2PWD(11) came for their turn, TC2PWD(12) was telling them how to control the Kart and reminded them to keep their finger on number 2. TC2PWD(12) also did this when their carer had a turn. [in reference to Wii] (FN)*

*TC3PWD(16) was encouraging three other participants when using the Wii Balance Board by commenting 'you've got it there mate, well done, keep going'; 'You've done well mate'; 'you are doing well.'; 'you are doing alright.' (FN)*

The technology, in particular the iPad, allowed topics of conversation to be introduced and discussed promoting social interaction within the groups. These were used successfully in one-to-one situations to increase social interaction and in a group setting to encourage general discussion;

*'..iPad and Google Earth were passed around the participants were asking questions about countries, TC3PWD(20) asked 'where's Australia?', TC3PWD(21) added, my brother lives in Australia. TC3PWD(20) added 'I know what Australia looks like.' (FN)*

*The participants were interested in You Tube as different songs and videos were played. Participants sang along to the words and watched the old music videos. ...TC1PWD(3) was very happy to watch the horses and was talking*

*about them extensively. TC1PWD(3) mood changed to be happy as they sat and watched the videos and told stories. They said 'they mean a lot to me.'*  
(FN)

*TC2PWD(13) was very interested in the different applications of the iPad and enjoyed looking at the place where they used to live. This activity triggered many memories from when they were at school and used to have lunch at the Natural Museum on Sundays.* (FN)

Conversations promoted by the technology predominantly focused on previous life experiences but also included current hobbies. These discussions allowed for a deeper understanding of the participants' lives to be ascertained. During these activities the dialogue flowed with ease and the participants' mood seemed to be lifted and upbeat;

*One participant from TC1 commented that they 'hadn't seen TC1PWD(3) smile for ages as they are always sitting looking sad, but today they are smiling.'* (FN)

Social interaction has been a salient finding reported in many of the studies exploring the use of digital gaming technology with people with dementia (Fenney and Lee 2010; Tobiasson 2010; Padala et al 2012) and this is consistent with the current study. The technology was an important medium to promote social interaction and subsequently group cohesion. Activities also encouraged the participants to reminisce. There are suggestions that this is something which can enhance the mood of people with dementia and is therefore important for their well-being (Cotelli et al 2012; Woods et al 2005).

## **Independence**

Gaming technology promoted independence for the participants as it offered them an opportunity to explore games, software and equipment independently away from the facilitators and carers. Whilst it is acknowledged that initial support was required, after this, participants were able to use the equipment (mainly the iPad and DS) and associated software (mainly apps of Google Earth and You Tube) alone;

*TC2PWD(11) picked up the DS and started using it on their own accord. The participant went straight to the camera facility unaided to take a picture of the research team to show his grandchildren. ... Whilst sat alone TC2PWD(12) started to use the iPad and type in addresses to Google Earth unaided....TC2PWD(11) played the Wii tightrope game. Unlike in a previous session 4 this participant was able to do this game completely unaided and without any advice. (FN)*

Independent use of the iPad, DS and Wii actively challenged assumptions around the abilities of people with dementia to use equipment independently. For example, two participants (TC4PWD(26) and TC4PWD(27)) had informal carers who owned iPads but who would not allow the participants to use them through fear of them breaking them and an assumption they couldn't use them.

Providing opportunities to use the equipment independently in the groups allowed participants a sense of empowerment and a chance to regain their rights as an individual. Two participants in particular fought to maintain their independence in using the equipment when support was offered;

*‘TC4PWD(25) was using the iPad but couldn’t see page, after the screen was enlarged the facilitator started to help the participant with the activity but the participant said ‘give it to me’ and took the iPad from facilitator.’ (FN)*

*When offered advice from facilitator when using the Wii TC3PWD(21) replied instantly with ‘I know how to do it.’ (FN)*

This highlights that whilst support may be offered with the best intentions it can undermine the abilities of those with dementia.

Five participants bought technologies (Wii, DS and iPad) they had been introduced to in the sessions for their personal use at home. This demonstrates a desire to continue to play independently of the group.

*‘Dad has talked about getting an iPad himself and has really enjoyed the possibility. It has opened up a new line of thought.’ TC2IFC(3) (SQ)*

*‘I want to buy one.’ TC3PWD(17) (SQ)*

The findings challenge the idea that people with dementia require continued support to use commercial digital gaming technology (Astell 2013). Although initially support may be required, overtime people with dementia can successfully engage in activities independently promoting a wider sense of empowerment contributing to healthy aging. In fact, some participants relished the opportunity to use the technology alone and were inspired to buy this equipment to continue with this level of independence at home.

### **Promoting healthy ageing**

The connecting finding from this work is that digital gaming technology can promote healthy ageing in participants with dementia by enabling them to challenge their own views of their capabilities as well as that of their informal and formal carers.

*Challenge own assumptions of capabilities*

For some participants, interacting with the games provided them an opportunity to challenge their own perceptions of their capabilities which resulted in a sense of achievement. One participant interacting with the Nintendo Wii balance board said:

*'It was great to see I could do it.'* [in reference to the Wii Balance Board]

TC2PWD(11) (FG)

However these assumptions and expectations to successfully engage with a game, particularly if it was something people had once been good at, at times deterred them from taking part. This was the case with one participant who used to be a truck driver and decided not to interact with a driving game for the Nintendo Wii.

*'I think with TC3PWD(19) he's been a macho man all his life, he's driven lorries and he's done all that sort of thing, and he's probably sitting there thinking, if I make a muck-up of it like all the rest of them they're going to laugh at me, and they don't like it men don't; they've got that thing about it.'*

[in reference to Wii] TC3FC(4) (FN)

This example provides an instance where tailoring the activities towards a participant's interest was not beneficial for their well-being predominantly due to the assumptions they held around their abilities and the expectations they felt about the need to perform well in front of the group.

This aspect of managing expectations and challenges was also present in other participants who were engaging in games which were not associated with their previous life experience.

*'The thing is that normally people like to succeed, they like to grasp at something okay, and find within a short length of time they can get some satisfaction out of it. Not a massive leap, but the fact is I didn't find any challenge, but that was a function shall we say...Take myself. I like a challenge, okay? I don't like finding that I'm not getting the hang of it...'* [in reference to iPad] TC4PWD(24) (FG)

#### *Challenging others' assumptions of capabilities*

By engaging with the digital gaming technology, participants from two Tech Clubs were able to challenge informal and formal carers perceptions of their abilities.

*'Yes. No, it is good, and I'm surprised at the ladies with that iPad and they go, no, no, do that. They weren't doing it right, but they were having a go at it.'* TC3FC(4) (SQ)

*'I think it's a great use to those with cognitive challenges to continue, just once a week, doing these sorts of activities, it is amazing what you suddenly realise is missing and what comes back the following week and I really think that does need to be observed and recorded.'* TC2IFC(2) (FG)

Following one of the Tech Clubs, a participant began to use the Nintendo Wii at home with their grandchildren and it was evident that this began to challenge their misconceptions of the participant's capabilities.

*TC2PWD(11) told about playing their Wii at home with their grandchildren. They played archery, bowling, golf, darts and Mario Kart and confirmed that their grandchildren were surprised at the participant's ability to play them games and how they were good at the games. (FN)*

Digital gaming technology can promote the healthy ageing agenda by challenging assumptions of the abilities of people with dementia both in those living with the condition and those supporting them. This can help people with dementia to defy the stigma associated with the condition (Benbow and Jolley 2012; Milne 2010).

### ***Discussion***

Our findings suggest that participants displayed a willingness and desire for continued learning, showing people with dementia are keen and able to partake in novel activities and learn new concepts; all of which are beneficial for their healthy ageing. This provides support for the notion that lifelong learning should continue despite a diagnosis of dementia (Alzheimer's Scotland 2009). Learning was by no means bound to activities which relied predominately on mental concentration alone. Learning was also apparent when using technologies requiring both mental and physical concentration. The findings suggest that not only did the participants learn complex movement and button combinations that relied on both mental, physical and fine motor skills, but that the participants were also able to develop this learning to acknowledge and correct mistakes, even before they were pointed out. Learning new skills enabled the participants to transfer this knowledge to other areas of their life. This has also been reported in other similar research (Leahey and Singleton 2011).

Our findings also support the idea that digital gaming technologies can be beneficial for other aspects of the Healthy Ageing Agenda. Provided they were offered the initial support,

overtime some people with dementia were able to successfully engage in activities independently which provided a wider sense of empowerment, contributing to healthy aging. This challenges the idea that people with dementia can only engage independently with technologies that have been specifically designed for them (Astell 2013). Our participants relished the opportunity to use this equipment alone which further inspired some to buy the equipment to continue with this level of independence at home.

Digital gaming technology also provides opportunities for mental, social and physical stimulation, by engaging participants in activities which require them to concentrate and use mental capabilities such as memory. This has also been found in the other similar studies (Fenney and Lee 2010; Leahey and Singleton 2011; Leng et al 2013; Padala et al 2012; Tobiasson 2010; Upton et al 2011). Participants enjoyed interacting with the activities particularly when they were tailored towards their interests supporting for the notion of person-centred approaches (McCormack 2004; Brooker 2004). Digital gaming technology can act as a catalyst to promote social interaction either through talking about the technology itself or the topics of conversation which are generated through the use of the games and the applications; such as reminiscing about days gone by. Having multiple digital gaming technologies can enable conversations to flow unabated for longer and can ensure the games and applications can be tailored towards the interests of the participants. Digital gaming technology can engage participants in fun activities to promote mild physical exercise. This may have additional benefits for their co-ordination and balance and was found in other studies using digital gaming technologies (Chao et al 2013; Padala et al 2012; Tobiasson et al 2010).

An important overarching finding was the ability for digital gaming technologies to provide a platform whereby people with dementia could challenge the perceptions and stereotypical views of their capabilities. This aligns well with the concept of ‘resistance’ which has recently been introduced in the dementia care field (Genoe 2010). Resistance is viewed as a struggle against power structures that spread through every-day life which can occur when social constraints and ideologies are challenged (Shaw 2006). Our findings indicate that participants, by engaging in non-stereotypical activities showed both themselves and others what they are capable of doing and so challenged negative discourses around dementia and ageing. This suggests that digital gaming technologies can not only provide activities which promote healthy ageing in people with dementia but also provide a platform to challenge stigma and negative perceptions surrounding the condition. If practitioners can be encouraged to move away from the stereotypical activities which are often provided to people with dementia (Genoe 2010) and embrace these novel and non-stereotypical activities, consequently it may make society more dementia aware and enable those living with the condition to become more socially active and connected (Bartlett and O’Connor 2010) . Digital gaming technologies may also be particularly beneficial when raising dementia awareness in the younger generation due to their intergenerational appeal (Upton et al 2011). Using digital gaming technologies as a platform for resistance to raise dementia awareness particularly within the younger generation is an area which requires further research.

## **Conclusion**

The use of digital gaming technology enabled community-dwelling people with dementia to engage in a range of innovative and creative activities benefitting their mental, physical and social well-being, sense of independence and opportunities for life-long learning. The combined impact of this is that gaming technologies provide an opportunity to promote

healthy ageing. Our data demonstrates that participants left the sessions with heightened wellbeing, increased levels of alertness, and a sense of empowerment. Engaging with the digital gaming technology provided participants with a sense of achievement as well as an opportunity to socially interact with other people. Participants chose to use the technology either on their own or in a group, promoting a sense of choice and independence. Participants also displayed a desire to learn more about the digital gaming technology and improve on their performances. There were also signs that this learning was transferred into everyday activities outside of the sessions to benefit well-being and promote intergenerational socialisation.

The findings from this study suggest that community-dwelling people with dementia are able to, and want to, engage with digital gaming technology. This challenges the notion of stereotypical activities suitable for people with dementia (Genoe 2010) and practitioners working in the field need to be more open to this medium as a way of promoting healthy ageing and independence for people with dementia. Further research should focus on providing a better understanding of how to use digital gaming with people living with dementia.

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## Table List

**Table one: Participant breakdown per Tech Club**

	<b>Total number</b>	<b>Male</b>	<b>Female</b>
TC1	10	1	9
TC2	3	2	1
TC3	10	5	5
TC4	6	3	3

Total	<b>29</b>	<b>11</b>	<b>18</b>
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**Table two: Identifier codes**

<b>Club Identifier</b>	<b>TC1</b>	Tech Club 1
	<b>TC2</b>	Tech Club 2
	<b>TC3</b>	Tech Club 3
	<b>TC4</b>	Tech Club 4
<b>Participant Identifier</b>	<b>PWD</b>	Person with dementia
	<b>FC</b>	Formal Carer
	<b>IC</b>	Informal Carer
<b>Data Identifier</b>	<b>FG</b>	Focus Group
	<b>SQ</b>	Self-Complete Questionnaires
	<b>FN</b>	Ethnographic Field Notes