

Cognitive Benefits of Digital Games for Older Adults

Strategies for Increasing Participation

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Abstract: There is evidence that shows that playing digital games has cognitive benefits for older adults. However, to reap these cognitive benefits, barriers that prevent full participation in gameplay must be overcome. This position paper describes the cognitive benefits of digital gaming for older people, outlines some of the obstacles they may face when playing digital games, and offers strategies that could help reduce these barriers so more older adults could enjoy the benefits of playing digital games.

1 INTRODUCTION

Between 2000 and 2050, the proportion of the world's population over 60 years will double from about 11% to 22% and the number of people aged 60 years and over is predicted to increase from 605 million to two billion (World Health Organization (WHO), 2014). The WHO report also predicts the number of people aged 80 and older will quadruple in the period 2000 to 2050.

Concern about the long-term impact of ageing populations is influencing public debate about quality of life as we age and about the resources needed to appropriately support older people to be physically and mentally active. Technology can play a role in this area as an increasing number of older adults are using technology as part of their daily lives. In April 2012 the Pew Research Center found for the first time that more than half of older adults 65 years or more used the Internet and 47% said that they have a high-speed connection at home (Pew Internet Research Project, 2012).

Older adults are also playing more digital games. Annual reports published by the Entertainment Software Association (ESA) show that mature gamers are becoming an expanding segment of the gaming population in the US. In 1999, 9% of the digital game audience was over 50 (Entertainment Software Association, 2005) while by 2011 29% of those who played games were aged 50+ (Entertainment Software Industry, 2011).

There is evidence showing that playing digital games can help to sustain and develop cognitive

abilities, but there are barriers that prevent older adults from fully participating in playing them. This position paper outlines the cognitive benefits of playing digital games, the obstacles that can inhibit participation, and suggests how these obstacles might be addressed so that more older people could enjoy the cognitive benefits associated with digital gaming in greater numbers.

2 COGNITIVE ABILITIES OF OLDER ADULTS

As people age, they often suffer losses in general cognitive abilities (Green and Bavelier, 2004). Although the impact of cognitive decline varies, impaired executive function has the most significant impact (Muijden et al., 2012). Executive function manages our ability to perform certain tasks related to perception, response, and maintenance of contextual information that is related to working memory, reasoning, and problem solving (Botvinick et al., 2001) (National Center for Learning Disabilities, 2014). In addition to normal ageing issues, diseases associated with ageing such as Alzheimer's, Parkinson's, and stroke can negatively affect the cognitive abilities of older adults. However, while cognitive decline is often considered to be a natural outcome of ageing, cognitive neuroscience suggests that this process could be slowed and perhaps even reversed with training or therapeutic techniques (Green and Bavelier, 2004).

3 DIGITAL GAMES AND COGNITIVE ABILITIES

Digital games draw upon multiple cognitive abilities and are designed to be fun to play. Games scaffold learning supporting participants to continue to play despite challenges they encounter in the game. These attributes could mean that digital games have the potential for enhancing the lives of older adults (IJsselsteijn et al., 2007).

With the advances of virtual-reality interactive technology, digital games have become an innovative venue for leisure activities for older adults (Chiang et al., 2012). For example, Nintendo Wii Fit™ and XBOX 360 platforms by Microsoft and Play Station Eye can support play that reflects the player's physical movement. Wii Bowling or Wii Fit digital games have been found to improve concentration, attention, memory, visual-spatial skills, hand eye coordination, decision making, and speed reactions (Calvert, 2004). Researchers have also determined that executive control processes such as switching tasks, working memory, and visual short-term memory can be significantly improved after playing digital games (Basak et al., 2008).

In their meta-analysis of studies that examined physical and cognitive impact of digital games on older adults, Zhang and Kaufman (2015) found that playing digital games had positive impact on older adults' balance, mobility, executive function, and processing speed. These authors also suggested that it is a fallacy that older people cannot learn digital games since older adults are just as capable as younger people in learning new things and adapting to new ideas and change. Their results confirm the findings of previous studies that "older adults do not need to be technologically savvy to benefit from training" (Kueider et al., 2012, p.11). However, older people have shown a preference for games that do not call for quick and exact movement and non-violent games (Nap et al., 2009).

4 CHALLENGES FACED BY OLDER ADULTS IN PLAYING DIGITAL GAMES

Providing enjoyable and interesting leisure activities to older adults is a serious challenge within the domains of care and technology (Bouwhuis, 2006). Barriers such as lack of guidance, lack of role models, fear, preferences, and lack of social support limit participation in physical activity (Allender et al.,

2006). It is possible that these same barriers also impede the level of older adults' participation in interactive computer games especially in those that require higher levels of dexterity, balance, and strength.

4.1 Game Equipment and Game Design

Inappropriate game design can also diminish the enjoyment of the game, reducing the health benefits and improvements to the quality of life that playing games can offer (Whitlock et al., 2011). When a technology is user friendly and not too difficult to use, and suited to the needs of an older demographic, older players are more likely to adopt and enjoy the experience of using it (Sauve et al., 2015). Usability is a factor in increasing the participation of older people in playing digital games.

Marston's comparison of the Nintendo Wii and Sony PlayStation2 consoles found that the choice of consoles can negatively impact game play (Marston, 2013). Her study included 68 participants with a mean age of 57 years who played Wii golf, tennis, or boxing on either Nintendo Wii with a remote or PS2 with a game pad. By measuring the level of flow—the quality of immersiveness and feelings of satisfaction associated with gaming—Marston concluded that the Wii remote was easier to use than the game pad on the PS2 console, facilitating more natural interaction with the game.

Some findings have suggested that readily available commercial digital games are not easily accessible to the frailest elderly (Gerling and Masuch, 2011). Gerling and Masuch's study of a digital game, SilverPromenade, developed for the Nintendo Wii for this age group, included 18 people in two groups living in full care homes with average ages of 80 and 81 and varying degrees of cognition and physical impairment. All but one of the participants depended on assistive devices and experienced some sensory-motor impairments. Eight had some experience with playing digital games and were familiar with Wii Sports equipment. Gerling's findings suggested that the Wii remote could be better designed for older adults if there were no small buttons and game play did not include time-based interactions. Observational data indicated that using the Wii remote for pointing activities posed barriers to those with more severe issues with coordination and dexterity issues. A short questionnaire showed that training participants beforehand provided a better experience for these players and that previous game experience had a positive effect on game

performance. Gerling and Masuch concluded that the participants were able to learn and use new technologies despite their physical limitations although there were some issues with game control.

A study by Hwang et al., (2011) also focussed on the design of digital games for older adults. This research produced and evaluated an embodied interactive video game (EIVG) that integrated human physical movement similar to the human-computer interaction experienced when playing Wii Bowling. The purpose of the study was to understand the usability and dependability of the game system for those with limited physical abilities. The study interviewed and observed 30 people aged 60 plus who were recruited from a rural community, as well as a group of elementary school volunteers, and a nursing home. Players interacted with animations via a webcam using their body movement to interface with the game system so no remote or keyboard was needed. The first game involved categorizing food for health, the second game was about identifying the symbols of Asian and European countries, and the third was based on speed of movements made during the game. The study found evidence that this kind of interface reduced player's physical barriers. Players were able to move any part of the body, eliminating the need to manage a remote and buttons while playing the game (Hwang et al, 2011). From the studies described here it appears that game equipment and game design both play an important role in game usability for older adults but the impact may vary by age and frailty of the player.

4.2 Psychosocial Barriers

Lack of instruction on how to play digital games and use the equipment, a lack of incentives to invest their time in using technology, and the low value of technology in their lives also negatively affect participation among older people (Marston, 2012). Acquiring technical proficiency can be a source of anxiety for older adults who are playing digital games for the first time (Wollersheim et al., 2010). In some cases, older people may feel that playing digital games is not appropriate for someone of their age (De Schutter and Vanden Abeele, 2010). In addition, the concept of "stereotype threat" may shape perceptions, whereby older adults believe they will not be able to understand digital games or like them (Schultz, 2006), creating the expectation of failure. These negative feelings may hinder older adults from playing digital games and prevent them from enjoying the cognitive benefits games they might offer.

To allow older adults to achieve some level of

success in playing digital games, IJsselsteijn et al. (2007) recommended providing positive feedback on learning goals rather than performance goals to increase the sense of self-efficacy. IJsselsteijn et al. also found the social aspects of playing digital games to be a strong motivator for older players. Allender et al. (2006) found that enjoyment and strong social networks were associated with greater participation in physical activity. It is possible that games that promote social connection could also increase the level of activity and participation of older people in playing digital games. Volda and Greenberg described Wii as a computational meeting place where older adults establish social contacts with peers and can experience intergenerational play. Volda and Greenberg's study included 30 participants from different age groups playing together in the same location. Their data suggested that intergenerational play provides developmental benefits for both older and younger players as well as creates an entry point for older players to become more digitally literate (Stephens et al., 2008).

Leisure activities such as playing games has been found to be a venue for informal learning and one of the chief reasons individuals initially learn how to use computers (Volda and Greenberg, 2012). Support for learning new technology is important to encouraging adoption and peer-to-peer mentoring is one method for developing greater computer literacy among older adults (Selwyn, 2005). Setting up equipment was found to be a particular challenge for older adults playing Wii bowling and a task often taken care of by a key person who was proficient with the technology or enjoyed using technology (Schell, Hausknecht, & Kaufman, 2015). Therefore, it seems that further guidance and support for game set up could help to build greater technical expertise among older players while enhancing their sense of self efficacy. It is possible that more instruction and practice on how to play would also promote greater engagement and self confidence in playing digital games.

Nevertheless, despite challenges presented to older adults playing digital games, perceived benefits can be more important to ageing individuals than the costs of poor design (Sharit, Czaja, Perdomo, & Lee, 2004). McLaughlin, Gandy, Allaire, & Whitcomb (2012) viewed the potential advantages of playing digital games within the context of a cost/benefit analysis. Through this model, the motivations of older adults for playing digital games can be understood as a balance between the perceived advantages of playing and disadvantages such as barriers encountered during game play. By promoting the cognitive and social advantages of playing digital

games more older adults may be encouraged to play (Higgins et al., 2010). Older adults have also cited the lack of realistic role models in the community as a deterrent to playing digital games and some older adults have wondered whether playing digital games is inappropriate for their age group (De Schutter & Vanden Abeele, 2010). Publicizing the fact that greater numbers of older people are playing digital games may help reduce these misconceptions and increase participation in playing digital games.

Appropriate incentives may also prompt older people to play digital games increasing the value of this technology in the lives of older people. McLaughlin et al. (2012) suggested integrating a reward system to encourage participation. Perhaps small prizes offered to winners in a game tournament, would be a fairly straightforward strategy to organize and implement and might provide incentives to older gamers to play digital games.

5 DIGITAL GAMES AND COGNITIVE ABILITIES

Older people could enjoy the cognitive benefits of playing digital games but a number of factors would need to be considered so that an optimal environment for play can be created for them. These factors include ensuring appropriate games and equipment are available; providing instruction and training; facilitating the social aspect of playing games; and providing incentives for participation publicising the advantages of playing digital games such as their ability to help maintain and improve cognitive abilities as one ages.

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