

Barriers and Adaptations of a Digital Game for Older Adults

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Abstract: The number of older adults playing digital games is increasing. However, there are few studies that focus on barriers that can limit ageing players from fully participating in these games. This paper describes some key findings regarding barriers reported by 17 older adults who played Wii bowling in an eight week tournament and how they adapted their playing style to overcome these barriers. This qualitative study found that physical issues such as visual impairment, balance, and strength affected the way these older adults played, but these limitations did not appear to curtail their enjoyment of the game. This may be partly due to adaptations they implemented in order to play such as using walkers, canes and other aids to support themselves. Adequate space was an important consideration for those using such aids.

1 INTRODUCTION

1.1 Background

The World Health Organization (WHO) estimates that worldwide, the proportion of people 60 years of age and over is growing faster than any other age group, and there will be a total of about 1.2 billion people over the age of 60 by 2025 (WHO, 2002). Aging older adults face difficult conditions as they experience declining physical and cognitive abilities, loss of life-long friends and partners, changed living arrangements, and increasing likelihood of chronic and debilitating illness (Kaufman, 2013).

As people live longer and the number of older adults increases in our society, concerns about future health care and social costs have promoted an interest in enhancing healthy living and “successful aging.” Successful aging is associated with an independent, positive, healthy, and meaningful quality of life. Achieving these goals can be a challenge for older individuals, but if encouraged and supported it may yield significant benefits for older adults and society at large.

Historically, much of what we know about the aging process has been oriented to medical or biological perspectives that tend to medicalize old age. More contemporary theories also consider factors such as overall well-being, lifestyle, financial resources, and the influence of home and community.

Being active is now thought of as more than the ability to be physically active or to participate in the labour force. Being active also includes participation in social, economic, cultural, spiritual and civic affairs (WHO, 2002). Through active aging, a healthy life expectancy and quality of life could be extended as people age. Within this framework, policies and programs that promote mental health and social connections are as significant as those that improve physical health status.

Technology can offer meaningful and engaging activities that are stimulating, enjoyable and fun (Sixsmith, 2006). Research has shown that digital games have the potential to enhance the social life of older adults (IJsselsteijn, Nap, de Kort, and Poels, 2007) and to exert a positive influence on an individual’s sense of well being (Goldstein et al., 1997). Mature gamers are becoming an expanding segment of the gaming population in the US. In 1999, ESA reported that 9% of the digital game audience was over 50 (Entertainment Software Association, 2005) and by 2011 twenty-nine percent of those who played games were 50+ (Entertainment Software Association, 2011).

Gaming is enjoyable because games provide an opportunity to produce feelings of mastery and a sense of achievement (Astell, 2013). Games are also associated with a feeling of immersion that results in a sense of satisfaction that players find enjoyable (Csikszentmihalyi, 1997).

Games have a social element when played with one or more other people that can enhance well-

being. Playing digital games offers a venue for meeting people, staying connected and coping with loneliness (De Schutter and Abeele, 2010). Playing digital games also produces positive feelings about other participants and their abilities (Whitcomb, 1990). However, to achieve the positive social outcomes associated with playing digital games, the design of digital games must be accessible and appropriate to the needs of older adults. Inappropriate design can inhibit or diminish the sense of accomplishment, satisfaction and self efficacy that make games enjoyable.

Some commercial games offer more accessibility to older adults than do others. Wii bowling was selected for our research as a game to study the social effects of game playing and to learn more about older adults' digital gaming experience. This game was chosen because many older people are familiar with this game and enjoyed bowling when they were younger.

This paper describes the barriers to playing Wii bowling as perceived by older adults, and how they adapted to play despite disabilities and other issues associated with ageing. We also offer some recommendations on how the game could be successfully implemented with other older adults.

1.2 Purpose of the Study

The purpose of this study was to explore the opinions and experiences of older adults (aged 60 years and older) who played the digital game Wii bowling during an eight-week tournament. Our focus was on the social-emotional aspects of playing Wii bowling and possible barriers affecting their gameplay and how they adapted their playing style to overcome these barriers.

The data collected will help to inform future studies investigating the use of digital games as a venue to enhance the lives of older adults. By understanding more about barriers and how they can be overcome from the player's perspective, other older adults may experience the benefits associated with playing a digital games such as Wii bowling.

1.3 Research Questions

This research was guided by the following questions:

1. What do older adults perceive as benefits and barriers to playing this digital game?
2. What are the key implementation issues for older adults who play this digital game?

2 LITERATURE REVIEW

2.1 Social Interaction and Successful Aging

In 1988, after reviewing five large prospective studies, researchers concluded a lack of social relationships had a negative impact on the lifespan of elderly people (House, Landis, and Umberson, 1988). More recent evidence shows that the quantity and/or quality of social relationships in western societies is decreasing. For instance, trends reveal fewer instances of intergenerational living, greater social mobility, dual-career families that reduce time available for the elderly, more single-residence households, and increased age-related disabilities (McPherson and Smith-Lovin, 2006; Putnam, 2000).

Research has established that social engagement can positively improve one's ability to age successfully (Rowe and Kahn, 1998) and active engagement in social activities plays a role in the level of life satisfaction (Bowling and Dieppe, 2005). In Rowe and Kahn's (1998) report for the McArthur Foundation, social engagement, defined earlier as being involved "in activities that are meaningful and purposeful" and "maintaining close relationships" (Rowe and Kahn, 1997), was included as one of the three major elements of successful aging. Digital games have the potential to support seniors in creating meaningful and enjoyable ways to enjoy life and the company of others (Nap, de Kort, and IJsselsteijn, 2009).

2.2 Digital Games and Older Adults

There are many studies showing that activities linked to casual leisure are associated with benefits including development and maintenance of interpersonal relationships and enhanced well being (Stebbins, 2007). As the number of older adults playing games increases (Pew Research Center, 2010), technology is providing them with new opportunities for casual leisure that promise significant benefits for enhancing their lives as they age (IJsselsteijn et al., 2007). Technology can play a more significant role in helping people at any age to live a happier and more satisfying life when the development of these technologies focuses on addressing more complex, higher level social needs (Astell, 2013).

Currently digital gaming is a technology dedicated to enhancing the enjoyment of life,

whether played alone or in social groups. Digital games have been oriented to the young, but as demographics change older adults are becoming important game consumers (Entertainment Software Industry, 2011). Digital games are enjoyable because they offer a venue to develop skills, attain mastery, and achieve a sense of accomplishment. These feelings tie into the notion of “flow” which describes the feelings of satisfaction and lack of sense of time when someone is completely immersed in an activity (Csikszentmihalyi, 1997). The flow effect of digital games has the potential to create positive experiences for older adults.

Digital games have been found to provide an environment that offers a culture of fun for older adults (Whitcomb, 1990). De Schutter and Abeele’s qualitative study (2010), which included a sample of 35 participants selected from a larger sample of 239 older gamers between 45 and 85, revealed that participants found digital games a fun way to spend their time.

Furthermore, when games include social interaction, there is the possibility of developing meaningful relationships with fellow players as well as having fun. Online games have positive impact on well-being and successful aging because they offer a venue for interacting with other people and enjoying leisure activities. An analysis of 50,000 posts collected from online social games showed that participants found that online games offered meaningful play, an opportunity for practice, a venue to demonstrate their abilities, and a means for coping with ageing (Nimrod, 2009). Nimrod noted that “regulars” “knew” one another and had interpersonal dialogues, mostly relating to the game. Nimrod also found that play and active entertainment were important goals for those who participated in social online games, and those who played digital social games frequently were often involved in sociable conversations. Players identified each other, exchanged personal information and experiences, and had their own “group humor.” The main categories of subjects in the postings — funny stories, jokes or other comments — fostered connectedness among players and provided enjoyable interaction and, to a certain extent, a sense of belonging.

Several studies have demonstrated that the social interaction that takes place when playing digital games is very important to older players (De Schutter and Abeele, 2010; Khoo and Cheok, 2006; Wollersheim et al., 2010). Playing digital videogames also promotes positive health outcomes associated with alleviating depression and reducing

feelings of loneliness and isolation (Wollersheim et al., 2010). Digital gaming also provides a venue for developing social capital that strengthens strong social ties both online and off (Trepte, Reinecke, and Juechems, 2012).

If digital games and games within online communities can enhance the quality of lives of older adults through the effect of flow experience and the facilitation of social interaction, research that explores older players’ barriers and adaptations to the game interface can produce information that improves gameplay and so enhances the social lives of older people.

2.3 Barriers and Adaptations

Research that focuses on barriers to older players of digital games is relatively rare, but it appears that for technology in general, age-related changes can influence how well technologies can be used and how easily they can be learned (Charness and Holley, 2004; Xie, 2002). We selected the Wii bowling game for our research because many older adults are familiar with bowling and the game is relatively simple to learn and play.

Wii Bowling offers a platform for multiple players where bowlers can use one or more controllers, while the game action is displayed on a large screen. The controller uses a motion sensor to detect the user’s movement and supports the player’s interaction with the game environment. The natural movement of the bowler is facilitated by the hand held controller, which is swung by the player in a similar motion to throwing a bowling ball. The participant faces the screen, which shows a virtual bowling lane.

Certain design features enhance game play for older adults playing a digital game such as Wii Bowling, including content variety, choice and flexibility (Marston, 2013). But often the game design industry does not take into consideration the needs of older adults to produce interface designs that could help enable mature players to take part in game play. In a study of ten digital game players, with a mean age of 67.8, problems were reported with system and in-game interfaces (Nap et al., 2009). In some cases, players have even reported pain when playing (Wollersheim et al., 2010). There is a correlation between age and optimal length of playing time for older people. Current knowledge of the needs of older players of digital games suggests that today’s commercial games pose usability challenges for many older adults (Buiza et al, 2009; De Schutter, 2011). When developing digital games

for older adults, elements such as display, navigation, audio, visuals, and rules all affect players' ability to effectively engage with the game and achieve a satisfactory experience (Sauvé, Renaud, Kaufman, and Dupl a, (2015, in press).

Despite these limitations, the number of older people playing digital games is growing, and there is evidence that their gameplay has social benefits.. However, very few studies have been conducted on the barriers that older players encounter and if and how they can adapt their playing style to play these games despite the types of physical limitations often associated with ageing.

Our research investigates what older players perceive as barriers and how they cope with these barriers while playing Wii Bowling.

3 RESEARCH METHOD

3.1 Participants and Recruitment

The participants for our qualitative study included 17 individuals 60 years of age and older, originally recruited as part of a larger quantitative study of 73 participants who played Wii Bowling in a tournament for eight weeks. Participants who took part in our qualitative study lived within an area comprised of three adjoining municipalities in the Greater Vancouver region of Canada. Twelve were recruited from independent living centres and five from assisted living centres. In these municipalities, independent living centres offer apartment living for those over 55, while assisted living centres offer services to residents such as meals, housekeeping, laundry, recreational opportunities, 24-hour emergency response, and personal care services.

3.2 Data Collection

We conducted interviews with participants who volunteered to take part in the qualitative portion of our study after participating in a Wii Bowling tournament at their centre. Each interview was about 30 minutes long and covered topics designed to elicit perceptions of the game playing experience and the formation during the tournament of friendships or social connectedness with their team members, their family and friends, and others in their centres. We also asked about their experience with the equipment and the disadvantages and advantages of playing Wii Bowling. These interviews were recorded and transcribed.

3.3 Instruments

The in-person interview was based on a semi-structured questionnaire that asked about the perceptions of the participants about the game experience in the Wii Bowling tournament. Each person was interviewed in their home and the conversation recorded on a smart phone. Some examples of the questions asked were: How would you describe your Wii Bowling experience?; Were there things you found difficult to do when playing Wii Bowling?; Do you think there were any drawbacks for other people who played in the Wii Bowling tournament?

3.4 Data Analysis

Seventeen transcripts were imported into MaxQDA for coding. The coding process encompassed three basic steps: familiarizing ourselves with the content of the transcriptions, applying open coding to the content, and lastly, analyzing codes for emergent themes. We began by applying preliminary coding to three transcriptions using pencil and paper to elicit the possible direction of the emerging codes. Once transcriptions were imported into MaxQDA, codes were applied to each statement using a word or phrase to summarize the basic meaning of each comment (Saldana, 2009). If more than one completely different idea was included in a statement, each idea was coded separately, but this occurred rarely in the analysis. Words that were simple affirmatives like, "Yeah" or part of introductions or other topics not related to the study were coded as "Irrelevant."

Codes were then organized to reflect the number of people whose statements were coded with the same code as well as how many times a particular code was applied. In this way, codes that applied to statements made by more than 50% of the participants were identified. Those codes identified were reviewed to determine their overarching themes. One of these overarching themes was Game Issues.

4 FINDINGS

4.1 Participants' Backgrounds (N=17)

Twenty participants were interviewed before the tournament began. Two dropped out of the tournament and data for one participant who only 58

was not included, as she was not in our target demographic of adults aged 60 years or older. Of the 17 who were interviewed a second time after the tournament, 11 had not played video games in the last five years; the remainder had played video games in the last five years.

1. Sex: Males (n=3); Females (n=14).
2. Age:
65-69 (n=3); 70-74 (n=2); 75-79 (n=6);
89-84 (n=2); 85-89 (n=3); 90+ (n=1).
3. Where do you live?
Assisted-living (n=5);
Independent (n=12).

4.2 Game Issues

Game issues were found to be an overarching theme that included seemingly contradictory codes. Codes applied to statements made by more than 50% of the participants collected under the theme of Game Issues are shown in Table 1.

Table 1: Number of participants' statements about game issues by theme code.

Code	Participants (N)
Playing with disabilities	9
Help with setup	10
No problem with equipment	10
Issues with Wii Equipment	11
No disadvantage playing Wii	14

4.3 Participants' Perceived Barriers

Although ten participants commented that they found no problems with equipment and 14 reported that there were no disadvantages to playing Wii Bowling, nine participants referred to their perceptions about the experience of playing Wii Bowling with disabilities and ten participants commented on help needed with setting up the game.

When asked about Wii equipment, difficulties with the controller were mentioned on a number of occasions. One player over 80 years old, asserted that some of her acquaintances found the use of the controller challenging but her statement appears to illustrate contradictions shown in the major codes "Well, the ones that I bowl with find it a positive experience. So, I don't know—everybody's different. I know they try it and get very upset at trying to master the—what they call...the controller."

The topic of playing with disabilities was described frequently and many players described the

controller as an issue. For example, one player commented: "Well, because I—I had carpal tunnel surgery on this hand and then I'm numb in the—I might have to have it in this hand. I found that my numbness—I really couldn't feel the buttons too easily and I would sort of goof up on the buttons. But I would eventually get it. I mean I think that's where a lot of people got hung up with the whole thing cuz they couldn't really manage the buttons"

Others were concerned with issues of balance, chronic injuries, and strength that affected their game play. One 80+ player referred to balance as a challenge to playing Wii: "A little bit of balance, but that was my balance, but I think we all had a problem with that because you were standing up without a walker. I don't use a walker, I use a cane when I go out but ah --- balance is a problem." When asked if there were drawbacks to playing Wii, one respondent who played seated a walker replied, "Just the standing, because they are used to using walkers, many of them. They rely on the walker." Nevertheless, over 50% of the participants declared they found no disadvantages to playing Wii Bowling. This may be because players enjoyed playing and overcame disabilities by using various aids.

One player described impaired vision as a problem although she enjoyed playing. Another described the sound effects produced by the Wii as wearing and very distracting, and they ended up turning the volume off. Equipment set up was often taken care of by a key person who was comfortable with the technology. In four of our five centres, there was a player or a resident who took responsibility for setup.

4.4 Using Aids to Play Wii Bowling

Despite the challenges older players faced with playing Wii Bowling and coping with the equipment particularly the controller and set up, those interviewed for this research study were able to play using aids while playing such as using a cane, a walker, wheelchair, or a learning or sitting on a chair to adapt to play with disabilities.

5 DISCUSSION

Reviewing the findings, we see that the design of Wii bowling game created barriers for older players as described in earlier studies (Charness and Holley, 2004; Nap, 2009; Xie, 2002). As suggested by Sauv e et al. (2015), game elements such as display,

navigation, audio, visuals, and rules should be considered when designing digital games for older adults' play. Since playing digital games has been shown to have social benefits (IJsselsteijn et al, 2007; Stebbins, 2007), future research studying how games could accommodate the needs of ageing adults would be of value. Furthermore, consideration of adaptations mentioned by our participants could be supported and put in place in other Wii game playing environments to allow physical aids to be used.

6 CONCLUSIONS

In our research, the design of the Wii game interface was not completely suitable for those with problems with dexterity and balance, but it appears that with even fairly serious disabilities, players can enjoy playing Wii Bowling. Fourteen of 17 Wii Bowling participants declared that they found no disadvantages to playing Wii. This may be due in part to adaptations they initiated which entail additional space when playing. One of the most challenging aspects for players was the set up of the game including the hookup of the monitor and using the controller. Perhaps future research exploring universal design approaches may provide improvements that are more inclusive.

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