Social Benefits of Digital Gaming for Older Adults: The Example of Wii Bowling

by

Robyn Margot Schell

B.A. Simon Fraser University, 1974
M.A. Simon Fraser University, 2006

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Name:	**Robyn Margot Schell**
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Title:	***Social Benefits of Digital Gaming for Older Adults: The Example of Wii Bowling***
Examining Committee:	**Chair:** John Nesbit Professor

David Kaufman
Senior Supervisor
Professor

Allan MacKinnon
Supervisor
Associate Professor

Shawn Bullock
Internal/External Examiner
Assistant Professor

Margarida Romero
External Examiner
Assistant Professor
Educational Technology
Université Laval

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Abstract

This research study investigated whether playing a digital game, Wii Bowling, with others can enhance the social lives of older adults. Our research used a mixed methods approach. Quantitative results showed that participants' perceptions of social connectedness increased and loneliness declined over an 8-week period. Qualitative results described participants' positive perceptions of their interactions with others, conversations with family and friends, social connections, and the team experience relating to playing in the multi-week, multi-location Wii Bowling tournament.

Keywords: Older adults; digital games; Wii bowling; Loneliness; Social Connectedness

Dedication

I would like to dedicate this thesis to my parents, Carl and Pat Schell, and to my husband, Richard Poole, for their encouragement, support and love.

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I would like to express my appreciation to my mentor and senior supervisor, David Kaufman, who inspired me with his knowledge, his vision, and his creativity.

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Chapter 1. Introduction

According to Statistics Canada (2014), the proportion of older people has been increasing steadily since the mid-1960s as a result of lower fertility rates and longer life expectancy (Statistics Canada, 2014). Thirty years ago, adults aged 65 and older composed only 10% of the Canadian population but in less than fifty years, by 2063, Statistics Canada predicts that those 65 years of age and over will account for between 24% and 28% of the population. These demographic changes have stimulated an interest in how older people can maintain a healthy and active, lifestyle that promotes a sense of wellbeing and a positive quality of life.

Improvements in public health and welfare have resulted in people living longer and healthier lives (Phillipson, 2013), yet certain aspects of ageing can be very difficult especially when one is faced with chronic illness and the loss of life-long friends and partners. While not all older people experience loneliness and social isolation, there is evidence to show that a substantial numbers of older adults are suffering from these negative feelings (Jylha, 2010; De Jong Gierveld et al., 2006; Victor et al, 2005). However, it is possible that loneliness and social isolation may be alleviated by engagement in meaningful leisure activities with others. Social engagement has been identified as a significant component of successful ageing, (Rowe & Kahn, 1997).

Playing digital games is a leisure activity that has potential to alleviate loneliness and enhance social connectedness among older adults (Whitcomb, 1990; Ijesselsteijn et al., 2007; Gamberini et al. 2009; Allaire et al., 2013; de Schutter et al., 2010). The present study is concerned with the social aspects of a playing a digital game, Wii Bowling and focuses on whether and how playing this game with others enhances the social connectedness and reduces loneliness among older adults. The key concepts that underpin this research are positioned within the literature on social theories of ageing, the changing nature of relationships among older adults, and the psychosocial impact of

playing digital games. We explore the concept of digital gaming as a social environment that could create an enjoyable opportunity for social engagement for older adults. We are interested in the ability of digital games to enhance the social lives of older adults who may be at a greater risk of feelings of loneliness and social isolation and use Wii Bowling as an example to investigate this possibility.

We would like to make it clear before proceeding on that the author of this thesis was also the coordinator of the research team and views this work as a collaborative effort. For this reason, the term “we” is used instead of “I” when describing the study.

Purpose of the Study

The purpose of the study was to examine whether playing a digital game, Wii Bowling, organized in the format of bowling tournament could have a positive impact on the social lives of older people. Although this game can be played alone, we chose to run a tournament and offer prizes for several reasons: 1) this helped enormously in recruiting older adults who had not played digital games before and would not have volunteered otherwise, 2) provided a structure that many players would find familiar and 3) introduced an element of team competition that would motivate players for eight weeks.

This study deployed a mixed methods approach to develop a more complete understanding of the psychosocial experience of older adults playing Wii Bowling in an eight-week tournament at 20 different centres in terms of friendship, loneliness, and social connectedness. Quantitative and qualitative methods had equal priority in the design in order to strengthen our claims and in certain instances to explain lack of convergence in the findings. Each method provided a unique yet complementary view of our research results. In this design both quantitative and qualitative data were collected in parallel and analyzed separately, then interpreted by reviewing both sets of data.

In the quantitative portion of the study, we administered a questionnaire both before and after an eight-week Wii Bowling tournament. The questionnaire integrated

three different scales to measure the extent of the participants' levels of social isolation and loneliness.

The goal of the qualitative component of our research was to learn more about the experience from the perspective of the participants. We learned about their personal experiences during the Wii Bowling by conducting interviews during and after the tournament. In this way we were able to collect data on such topics such as the social benefits and barriers to playing Wii Bowling, as well as identify implementation issues that could affect gameplay.

Research Questions

The research questions were as follows:

1. Does playing a digital game, Wii Bowling, with peers in a tournament reduce older adults' feelings of social isolation and loneliness?
2. What do older adults perceive as benefits of playing the digital game, Wii Bowling, in the tournament?
3. What do older adults perceive as barriers to playing the digital game, Wii Bowling, in the tournament?

Data Sources and a Brief Overview of Methods

To collect data for this study we utilized both quantitative and qualitative methods to enable a deeper understanding of the process occurring in an eight-week Wii Bowling tournament. A triangulation-transformation model design (Creswell & Plano Clark, 2007) was used first to identify participants change in friendship, loneliness, and social connectedness over time (quantitative measures), then highlight and richly describe the events or processes occurring during this time period (qualitative data).

We also asked for an independent assessment of the transcription coding and conducted a member check in which five of those included in the interviews were asked

to review the coded transcriptions and provide feedback on how well the coding captured the essence of their statements.

Outline of Dissertation

There are five chapters in this dissertation: Introduction, Literature Review, Methods, Findings, Discussion and Conclusion. Chapter 1 provides an overview and introduction to our research.

Chapter 2 reviews the existing literature that provided a framework for our study. This literature sets the stage for a closer examination of the social lives of older people by first outlining the psychosocial perspective of ageing, then describing the nature of older people's relationships in later life. Next, we will look at the concepts of loneliness and social connectedness and identify the factors that are most likely to produce these unwanted feelings. We then turn to how loneliness might be alleviated and the social networks of older adults expanded. We then consider the potential of digital games in light of the growth in the numbers of older players, and the characteristics of digital games. Lastly, we discuss the social benefits associated with digital games as well as the barriers they might present.

Chapter 3 presents our research design and methods and describe how our research was implemented and our rationale for using this approach.

Chapter 4 reports our research findings in terms of demographic characteristics of our participants, followed by quantitative and qualitative findings. The quantitative findings include data collected through pre- and post-questionnaires that measured the level of friendship, loneliness, and social connectedness before and after an eight-week Wii Bowling tournament. The qualitative findings were gathered through in-person interviews with some of these participants.

Chapter 5 reviews our findings in light of previous studies focusing on the social aspects of playing digital games. Our goal is to show how our research has added to the literature on the ageing experience as it relates to social life of older adults and the role

that digital games might play in enhancing their lives by reducing loneliness and increasing social connectedness. We also describe the limitations of our study. This final chapter also includes recommendations for improving the gaming experience for older adults as well as suggestions for future research.

Study Organization & Research Team Responsibilities

The study was carried out by a team of seven research assistants who were assigned to specific centers in the urban area. Robyn Schell, the author of this thesis, was team lead and the project coordinator and directed all the activities associated with this research study including the management of the team and their work. All contributed to the recruitment of participants, and the design and administration of the quantitative survey although Robyn Schell supervised this work and approved the final version of the survey and how the work was carried out. The analysis of the quantitative results was done by one research assistant with an expertise in this area.

Robyn Schell recruited the participants who were interviewed personally for the qualitative portion of this study. Robyn also designed the interview protocol, conducted the personal interviews, and analyzed these results. Robyn was also responsible for the carrying out the application of mixed methods approach and activities as well as the analysis described in this study. Because the study was a large scale team based undertaking, the pronoun “we” has been used to describe the study and later changed to first person when discussing the results and conclusions.

Chapter 2. Literature Review

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 expected to increase from 605 million to two billion over the same period (World Health Organization (WHO), 2014). The WHO report also showed the number of people aged 80 and older will quadruple in the period 2000 to 2050.

The ageing of the Canadian population reflects these world demographic projections. In 1971, the median age was 26.2 years in Canada; in 2011, the median age was 39.9 years, with seniors making up the fastest-growing age group. This trend is expected to continue for the next several decades due to a below replacement fertility rate, an increase in life expectancy, and the aging of the baby boom generation (Human Resources and Skills Development Canada, 2014). The number of Canadians 65 years of age or older is expected to double in the next 25 years to reach 10.4 million by 2036. By 2051, about one in four Canadians is expected to be 65 years or older (Human Resources and Skills Development Canada, 2014).

Concern about the long term impact of ageing populations is influencing public debate on several fronts including the quality of life as we age, intergenerational relationships, and the resources needed to appropriately support older people over time. Investigating social environments that facilitate active participation and independence of older people can provide valuable information how the quality of life of older adults can be sustained over the life course. 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 were internet users (Pew Internet Research Project, 2012). These authors also found that fifty-nine percent of seniors reported they go on the web and 47% said they have a high-speed connection at home. 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, ESA reported that 9% of the digital game audience was

over 50 (Entertainment Software Association (ESA), 2005) while by 2011 twenty-nine percent of those who played games were 50+ (Entertainment Software Industry, 2011).

Our research is concerned with the potential of digital games to create social engagement and alleviate the loneliness and isolation suffered by some older adults. In this chapter we review gerontological theory, the relationships of older people, and the phenomena of loneliness and social isolation. Next, we examine the potential of digital games to enhance the social life of older adults. Finally, we discuss the attributes and potential benefits of digital games, Wii Bowling specifically, followed by a description of some of the barriers preventing older adults from fully participating in digital games such as Wii Bowling.

Psychosocial Perspective on Ageing

Traditionally, ageing research has been categorized in three domains; biological, medical and social sciences (Evans & Bond, 1997). Much of what we know historically about the aging process has been oriented to perspectives that tend to medicalize old age while earlier social theories of ageing focussed on psychological changes experienced by people as they age (Putnam, 2002). Three prominent early theories are disengagement theory, activity theory (ageing), and continuity theory.

Rather than seeing positive ageing as a process in which people take an active role in life, disengagement theory views aging as a process of mutual withdrawal in which older adults voluntarily slow down and conform to the expectations of society (Cumming & Henry, 1961). Proponents of disengagement theory held that mutual social withdrawal benefits both individuals and society by helping ageing individuals to better adhere to societal norms and ease the transition to end of life.

Activity theory of ageing, developed by Havighurst (Havighurst, 1961) as part of his work on successful ageing, suggested that through activity, older adults adjust to changes in life and achieve satisfaction. While individuals face inevitable changes related to physiology, anatomy, and health status, their psychological and social needs remain essentially the same throughout life. In one study, the researchers conducted a

formal and explicit test of Havigshurst's activity theory on ageing in 1972, examining a sample of 411 people moving to a southern California retirement community (Lemon, Bengston, & Peterson, 1972). When they looked at informal activity with friends, relatives, and neighbors and formal activity involving participation in voluntary organizations, and solitary activity, they discovered that social activity with friends was significantly related to life satisfaction rather than frequency of activity overall as suggested by Havighurst.

Knapp's study of 51 elderly people in the south of England lent support to Bengston et al's findings (Knapp, 1977). Within this sample, researchers revealed a connection between activity and satisfaction and a strong positive relationship between satisfaction and the number of hours spent in a typical week with friends and relatives participating in informal activity. While activity theory on ageing advocated that leading an active life will result in a full productive old age and those who are engaged and active are happier, and more in touch with people around them (Havighurst, 1961), this theory was criticized for defining activity too broadly since simply being busy does not necessarily result in fulfilling and engaging experiences (McPherson, 2004). This theory also failed to consider how and which lifelong activities are maintained as one retires or enters the phase of older life. What is fulfilling throughout life also depends on which activities were engaged in as a younger person since focusing on the period of old age alone without considering the full lifespan cannot determine one's satisfaction with life.

Continuity theory suggests that those who continue habits, preferences, relationships and lifestyle into their old age will age positively. In continuity theory, Atchley (1989) built on activity theory, proposing that people attempt to maintain continuity in their lifestyles, activities, and relationships as they age by adapting to both internal changes such as personal attitudes, values, and temperament as well as external changes such as activities and surroundings (Atchley, 1989). Atchley (1989) argued that individuals actively work to maintain continuity of the self as they age even as their conceptions are increasingly tested.

One of the most well-known frameworks for the study of aging was described by Rowe in the MacArthur study as "successful ageing" (Rowe & Kahn, 1998). Based on a

three-site longitudinal study of elderly US adults living in the community in 1988, Rowe concluded that three main interacting components accounted for successful aging: low probability of disease and disease-related disability, high cognitive and physical functional capacity, and active engagement with life. To further differentiate between “diseased” and “normal” groups, Rowe and Kahn distinguished between “usual” ageing meaning a normal decline in physical, social, and cognitive functioning associated with aging, and successful ageing, whereby the level of functional decline is minimized with little or no age-related decrease in physiological and cognitive functioning (Rowe & Kahn, 1987).

Leonard Cain introduced the concept of ageing within the context of social structure and personal history (Cain, 1994). His work initiated an interest in generational differences that became central to later life course analyses. Cohort analysis is a key element of the life course perspective that focused on the role of social conditions in forming life patterns. A cohort is defined as a group born within a particular era or time interval which impacts the trajectory of their lives. This approach, although criticized for attempting to amalgamate group characteristics to explain individual ageing processes, was instrumental in the development of longitudinal research on ageing and changed the direction of psycho-sociological research methodologies (McPherson, 2008).

Recent theories take a more holistic perspective on wellbeing in later life looking at a variety of influences such as social participation, psychological wellbeing, financial wellbeing, active lifestyle, and living situation (Boulton-Lewis, Buys, Lovie-Kitchin, Barnett, & David, 2007). In 2002, the World Health Organization (WHO) incorporated the concept of active ageing in their report which broadened the definition of “active” beyond the ability to be physically active or participate in the labour force. WHO defined active ageing as participation in social, economic, cultural, spiritual and civic affairs. The report claimed that through active aging a healthy life expectancy and quality of life could be extended as people aged. Within an active ageing framework, policies and programs that promote mental health and social connections are as important as those that improve physical health status.

Today, what it means to age well is now deeply entwined with the concept of quality of life in old age (Bowling, 2005). Bowling defines ageing well within the context of quality of life whereby older adults can prioritize, optimize and make adaptations, based on access and opportunities that include new technologies that make life meaningful and satisfying. The definition appears to reinforce the move away from earlier negative interpretations of old age to a more positive view that sees old age less in terms of disease and pathology dwelling on physical decline and psychological functioning towards an understanding encompassing wide ranging factors such as social well-being, independence, control, physical environment, and personal perspective.

In effect, there have been a variety of complex, separate models of quality of life that can attempt to provide a conclusive definition of ageing well. The models appear to be overlapping and inter-related and are very difficult to separate. Each model whether based on social indicators, objective or subjective indicators, including health, support and active lifestyle show aspects of ageing well and quality of life that are not mutually exclusive. But are the relationships of older adult different in some way from those who are younger? The next section looks at relationships of older adults and their influence on the quality of life.

Relationships in Later Life

A positive link has been established between social relationships and quality of life (House, Landis, & Umberson, 1988). When reviewing how social relationships enhance the quality of life for older adults, we must first understand how the structures of social relationships have evolved within our society in recent decades. In this section we identify the types of relationships integral to the lives older adults and explore how social networks and social connectedness impact the quality of life as people age. The nature, description, and extent of loneliness and social isolation among older adults are also discussed as well as how these social conditions can impact the quality of life as we age.

Relationships and Health

In 1988, after reviewing five large scale studies, researchers concluded there was a causal association between social relationships and mortality (House et al., 1988). House et al. (1988) contended that the lack of social relationships was a major risk factor for health as equal to the hazards of smoking, high blood pressure, and obesity. They linked the trends showing fewer instances of intergenerational living, greater social mobility, later marriages, dual-career families, more single-residence households, and increased age-related disabilities to a decline in the quantity and/or quality of social relationships in western societies. In addition, they pointed to a three-fold increase in the number of Americans who reported having no one with whom to confide. Such findings, they suggested, demonstrated that despite increases in technology and globalization that would presumably foster social connections, people were becoming increasingly more socially isolated. Some of the factors will be discussed in detail later in this chapter as more recent studies show that the impact of these social changes have not proven to be as negative as some predicted.

Social relationships are thought to relieve stress by providing support in times of need either directly or indirectly (Cohen, Gottlieb, & Underwood, 2000). Indirectly, social relationships provide resources whether informational, emotional, or tangible which help to reduce the acute or chronic stress brought on by life events such as illness or losing a partner. Social relationships may be also associated with protective health benefits through more direct means by influencing cognitive, emotional, behavioral, and biological effects that are not explicitly intended to provide help or support (Holt-Lunstad, Smith, & Layton, 2010). Furthermore, being part of a social network can create positive feelings of self esteem and self worth and having a purpose in life (Cohen, 2004). These positive effects have implications for how we view the social impact of playing a digital game with others such as those we describe later in this study.

Relationships among Older Adults

When looking at the impact of playing digital games, understanding the nature of relationships in later life could help illuminate the findings we discovered when studying

the social environment of playing Wii gaming in a tournament situation. There have been a number of societal changes that have impacted the social life of older adults.

The stages of life have become more fluid to the point where older adults are taking a more improvisational approach to how their lives unfold in terms of relationships (Allan, 2010). New types of relationships are emerging within the diverse contemporary structures of society, resulting in an availability of connections within a broader social milieu than before. There are opportunities for intergenerational exchanges as generations are more likely to overlap and interact (Marshall, Matthews, & Rosenthal, 1993). Social ties with friends also offer a new source of significant relationships. Although the lives of older people are generally viewed within the family context in the context of support and care, non-kin ties are becoming more influential in the lives of older adults (Beck, 2000). This can be partly attributed to the growth of single person households and the growth of numbers of people who live alone (Klinenberg, 2012). It is now more likely that older adults will develop a myriad of social relationships among a variety of connections that some have referred to as personal communities consisting of friends, neighbors, and other acquaintances who give and receive help at different points in life (Phillipson, 2013). In some cases friends are replacing family as sources of support in old age. These relationships of choice can be critical in enhancing mental health (Phillipson, Bernard, Phillips, & Ogg, 2000) as well as informal support. Over a lifetime, while some older adults make friends more easily while others do not, so it is possible that institutional support may be necessary to help develop and sustain these friendships. The development of new forms of relationships across age groups and social groups and outside of kinship groupings has changed the composition and dynamics of the social life of older people.

Friendship is understood as voluntary connection between equals where reciprocity and balance of exchange exist rather than a relationship being sustained for its benefits alone (Allan, 2010). According to Allan (2010), friendships are based on personal solidarity and involve the enjoyment of that relationship. Often this friendship develops within social situations and leisure activities. Allan (2010) noted that some friendships are sustained despite the absence of social activities and are continued on a foundation of committed solidarity based on intimacy and understanding. This type of

friendship develops out of a variety of shared experiences over a long period of time. However, it is likely that people's patterns of friendship and interactions will change as they age. This change is not necessarily due to ageing alone but is a result of changing circumstances through life course (Allan, 2010). Studies concerned with older adult friendship networks will be discussed in more detail in the next section on social connectedness and feelings of loneliness among older adults.

Loneliness and Social Connectedness among Older People

This section defines loneliness and how it differs from social isolation. We also attempt to answer the question: are older people lonely or socially isolated? and identify who is at risk for loneliness and why. Finally, we examine the success of interventions intended to alleviate loneliness and social isolation in order to identify those factors that have shown positive results.

Loneliness has been defined as unpleasant feelings arising from a lack of both amount and quality of social relationships (Perlman, 2004; Weiss, 1973). In his classic study, Weiss described two dimensions of loneliness: emotional and social. Emotional loneliness refers to a lack of attachment to others while social isolation is an absence of an acceptable social network. Hawkley & Cacioppo found that feelings of loneliness related to an individual's perception of the difference in quality and quantity of social engagement (Hawkley & Cacioppo, 2010). These authors suggest that living alone and time spent alone do not by themselves contribute to the experience of loneliness and social isolation. Being alone does not necessarily lead to loneliness and while in some cases, temporary solitude is welcomed, in other situations loneliness can occur even in the presence of others (De Jong Gierveld, 1998). The literature on loneliness is complicated as it contains many interrelated and overlapping concepts such as being alone, living alone, aloneness, solitude, and feeling lonely (Jylha, 2004).

Loneliness exists within the context of individual, interpersonal, and societal perspectives (Jylha & Saarenheimo, 2010) where characteristics are viewed as complementary rather than mutually exclusive (Jylha, 2010). Often social and demographic perspectives of loneliness focus on socio-demographic circumstances,

economic and financial situation, health, and life events (Victor, Scambler, Bowling, & Bond, 2005). The psychological perspective views loneliness as emerging from personal experiences with others or deficits in social skills (Jylha & Saarenheimo, 2010). Early theoretical frameworks such as Disengagement Theory advanced by Cummings and Henry suggested that older people choose to disengage from social activity in preparation for retirement and widowhood (Cumming & Henry, 1961) but more recent theory as advocated by Kahn and Rowe view active engagement as key to successful ageing (Rowe & Kahn, 1998). However, there are some negative consequences of loneliness linked to depression although this is considered to be a separate condition.

Loneliness and Psychosocial Effects

Depression and loneliness can coexist but are distinct conditions (Jylha, 2010). Jylha (2010) describes depression as a mood disorder characterized by loss of pleasure and low mood associated with sleep and eating disorders. Loneliness has been recognized as a mental health problem among older people and some research has identified a link between loneliness and depression in later years (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006). While depression and loneliness can occur together, loneliness is not included in standard diagnostic tests for depression (Jylha, 2010). However, some studies identify loneliness as a risk factor in the symptoms of depression (Hawkley & Cacioppo, 2010). These studies appear to suggest that although loneliness and depression can occur independently or together, the exact relationship is unclear.

Psychosocial issues can lead to poor health outcomes and depression has been linked to higher risks of disability and death (Segrin & Passalacqua, 2010). Other studies show that a low number of contacts and social engagement are also associated with adverse health (Steptoe, Shankar, Demakakos, & Wardle, 2013) and diminish one's sense of wellbeing and quality of life (Ashida & Heaney, 2008). Increasing the web of contacts in an individual's social network has shown to lower feelings of loneliness and increase feelings of social connectedness (Ashida & Heaney, 2008). Next we discuss some of the more common predictors of loneliness among older adults.

Predictors of Loneliness

Certain factors have been found to increase one's susceptibility to loneliness. Data collected through quantitative studies using personal interviews or surveys have often focused on frequency and intensity of the experience itself (Jylha, 2010). The UCLA Loneliness Scale (Russell, 1982; Russell, 1996) is one of the primary instruments for measuring loneliness as well as those that have been developed by De Jong Gierveld & Kamhuis and Wenger & Burholt (De Jong Gierveld & Kamphuis, 1985; Wenger & Burholt, 2004). Even when using different questions and measures, representative samples taken in Europe and US, showed 5 to 10% of older people were lonely often, and 20 to 40% were sometimes lonely (Jylha, 2010). Victor et al. found that a third of participants in their study who were often alone or always alone, reported never feeling lonely (Victor et al., 2005a).

Victor et al.'s study on age-related loneliness based on quantitative measures of 1,598 respondents aged 65 and above found that of the 26 variables they identified, the oldest, the widowed, and those living alone had the most significantly higher levels of loneliness (Victor, Scambler, & Bond, 2009). In Victor's study examining age-related loneliness over time, two thirds of respondents reported the same level of loneliness as ten years before, while 23% reported that they were lonelier, and 10% reported that they were less lonely (Victor et al., 2005a).

Although there may be many predictors, studies have consistently reported that some life events, poor health, and widowhood precipitate changes in personal relationships (Burholt & Scharf, 2013). For instance, when one is not well, interaction with others is less frequent; the loss of a partner in life may result in the loss of one of life's most intimate relationships. When looking into the link between marital status and loneliness, older people with spouses reported less loneliness (Tunstall, 1966). Non-married people, men in particular, appeared to lonelier (Stack, 1998) as well as widows and widowers (Townsend, 1968). When focusing on gender, Victor et al. found that older women were not any lonelier than older men (Victor, Scambler, Marston, Bond, & Bowling, 2005b) while De Jong Gierveld and von Tilberg (De Jong Gierveld & Von Tilburg, 1999), and Townsend (Townsend, 1968) both found that women with children were less lonely than those without children. Those with a close friend or confidant were

less lonely than those without (Julha, 2004). Those living in institutions expressed more feelings of loneliness but this may also be related to poor health and fewer age peers and the breakdown of long term community (Jylha, 2004). Poor health, both mental and physical (Jylha, 2004; Russell, 1996; Victor et al., 2005a) and lack of financial resources were also closely correlated with loneliness (Scharf & de Jong Gierveld, 2008).

When studying the relationship of old age and loneliness, the oldest old experienced more loneliness than the young old (de Jong Gierveld & Tilberg, 1999). In longitudinal studies, both Jylha, and Wenger and Berholt found increasing levels of loneliness over a 10 to 20 year period (Jylha, 2004; Wenger & Berholt, 2004). These studies found that for many, feelings of loneliness increased with age and were connected to negative changes people experienced in later old age such as decreasing functional capacity, increasing dependence, and death of a spouse. These studies also showed that feelings of loneliness may not be long term and can be reduced by improved health and through expanding social networks (Jylha, 2004).

The following figure adapted on work by Jylha (2010) depicts some of the factors associated with loneliness among older people.

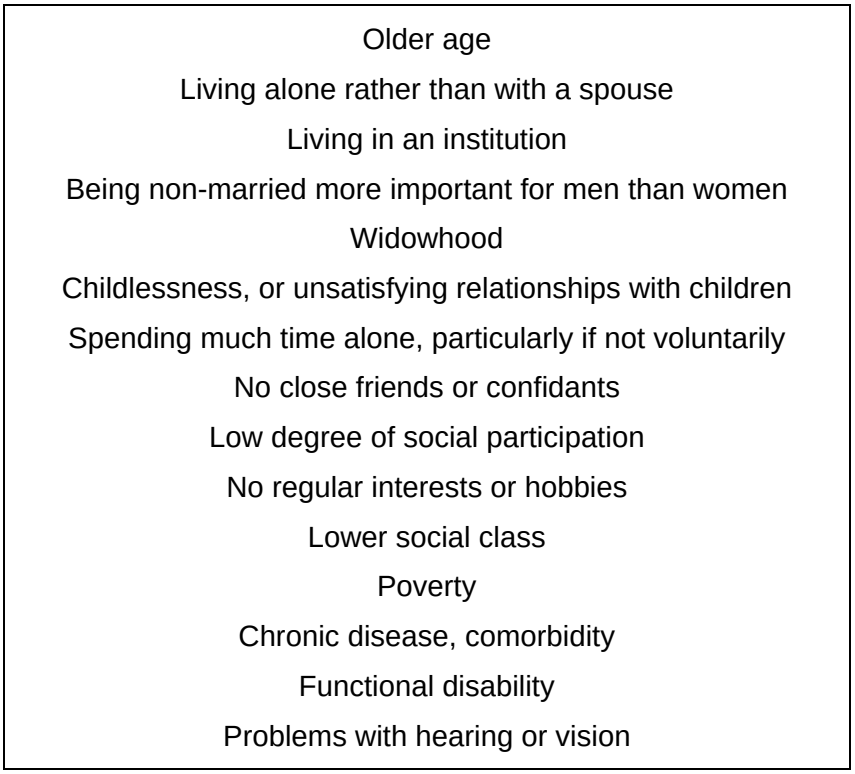

Figure 2-1: Personal circumstances likely to increase vulnerability to loneliness (Jylha, 2010).

Social isolation may also play a role in loneliness since limited access to social support, small social networks, and low levels of social contact have been associated with feelings of loneliness (Adams, Leibbrandt, & Moon, 2011). In an analysis of the relationship between loneliness and social isolation among 6500 participants in England, Steptoe et al. found a positive correlation between these two conditions (Steptoe et al., 2013). They also found that both social isolation and loneliness were positively associated with a higher mortality rate among their participants. However, their results indicated that social isolation rather than loneliness was the critical factor in an increase in mortality. These researchers concluded that reducing the levels of both social isolation and loneliness were important for improving the quality of life and wellbeing of older adults but reducing social isolation would produce even greater benefits.

The next section describes some of the research focussed on how loneliness and social isolation can be reduced among older adults.

Alleviating Loneliness & Expanding Social Connectedness

The complex nature of loneliness means that creating and evaluating interventions that address this condition is challenging with the most successful examples involving group methods and participatory activities (Cattan, White, Bond, & Learmouth, 2005). In Cattan's systematic review of the effectiveness of health promotion interventions to alleviate and prevent social isolation and loneliness among older people, it was found that group interventions involving some form of education, training, and social activities that targeted specific groups had some success.

Dickens et al. noted similar findings in their systematic review of interventions aimed at alleviating social isolation or loneliness in 2011 (Dickens, Richards, Greaves, & Campbell, 2011). These researchers also found that interventions offered at the group level were more likely to be beneficial than those offered on one-on-one basis. Those that provided opportunities for participating in a social activity while receiving support were more helpful. These authors also identified a need for rigorous evaluations of interventions undertaken in studies of loneliness. Furthermore, a combination of psychological, social, and environmental elements, if implemented, would offer a repertoire of tools that could be used to personalize interventions (Jylha, 2010). When an existing network is limited, network building can create new contacts (Rook, 1984) when social structures are provided to facilitate interaction with others.

Social activity can be effective in reducing loneliness and social isolation (Cattan et al., 2005). Although social participation has been traditionally thought of in terms of face-to-face activities such as attending church, going to the movies, or physical activities such as taking a walk or swimming at a community centre, technology may be useful in developing social connections (Baecker, Moffatt, & Massimi, 2012). Some digital games are built on social networks and by nature are considered to be social activities. Since loneliness is believed to be a deficit in the broader range of social contact (Heylen, 2010), expanding the social network through digital games may provide benefits that bridge this gap, resulting in decreased feelings of loneliness while increasing social connectedness.

Older Adults and Digital Games

Technology offers new opportunities for casual leisure that can benefit the social lives of older adults as they age (IJsselsteijn et al., 2007), particularly when these technologies focus on addressing more complex, higher level social needs (Astell, 2013). Older adults are becoming significant consumers of technologies including digital games (ESA, 2011). Developing skills and mastering a game can create a sense of accomplishment (IJsselsteijn et al., 2007), and the flow effect of digital games has the potential to create positive experiences for older adults. The feeling of flow occurs when one is immersed in an activity for its own sake, and in the process loses track of time, and experiences a sense of satisfaction and enjoyment in that activity (Csikszentmihalyi, 1997).

When games include social interaction, they may offer a venue for enhancing the social lives of older adults. Social activity can be effective in reducing loneliness and social isolation (Cattan et al., 2005). Although social participation has been traditionally thought of as face-to-face activities, technology may be useful in supporting and developing social connections (Baecker, Moffatt, & Massimi, 2012). Some digital games are built on social networks and are social activities. Since loneliness is believed to be a deficit in the broader range of social contact (Heylen, 2010), expanding the social network through digital games may provide benefits that bridge this gap, resulting in decreased feelings of loneliness.

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. 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 & Holley, 2004; Xie, 2002).

This next section describes the growth in the numbers of older adults playing digital games, their motivations for playing digital games, and the potential for digital games to create an environment that provides social benefits for older people. We also

describe Wii Bowling, a digital social game that is the focus of our current study as well the barriers that may affect participation in game playing activities.

Growth in Numbers of Older Players

In 2008, a survey found that more than 25% of adults over 65 played video games and those who did played more than younger people (Lenhart et al., 2008). The first generation of gamers that grew up playing games is still playing them: an independent study of more than 300 participants showed that Baby Boomers born between 1946 and 1964 are actively engaged in playing digital games (Pearce, 2008).

The Entertainment Software Association (ESA), which issues annual reports of the video game industry, estimated in 1999 that only 9% of players were gamers over 50 years old but by 2005 this number had grown to 19% and by 2007 to 24% of the US gaming population. The table below shows the growth of mature gamers based on ESA data as compiled by Marston showing steady growth of mature gamers over a period of nine years (Marston, 2014)

After 2012, ESA no longer reported the percentage of gamers aged 50 years of age or more. Also, mobile devices are now included in ESA data which has had the effect of lowering the average age of gamers from 37 to 30 when compared to previous years.

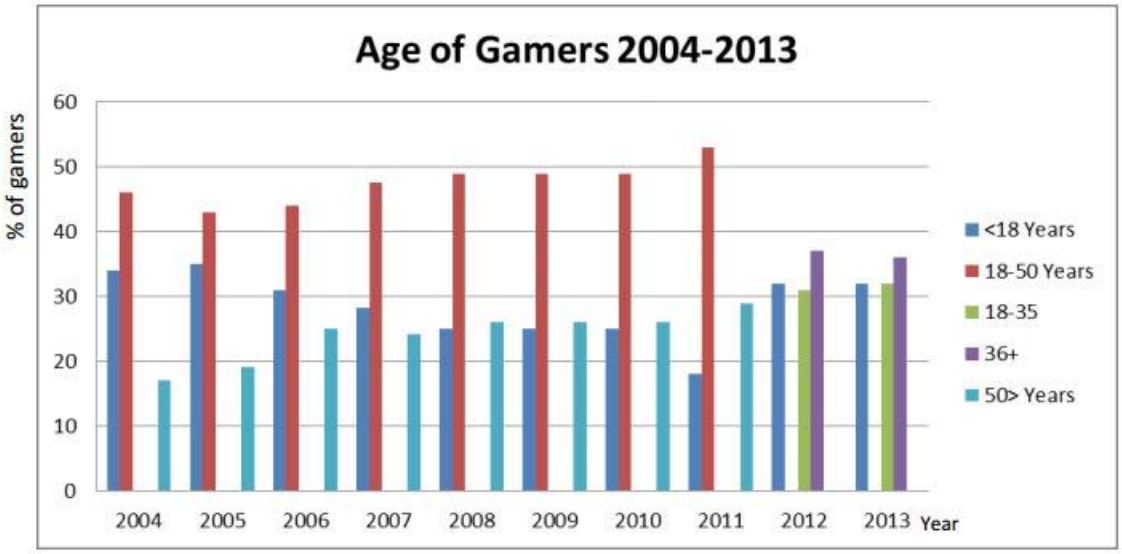

Figure 2-2: Displays the increase of gamers (by age) since 2004 as collected by ESA (Marston, 2014)

In the UK, 18% of gamers (about 1.7 million) in UK were between 51 and 65 (Pratchett, Harris, Taylor, & Woolard, 2005) but playing times can be quite different among the older players depending on whether players are casual, moderate, or heavy game players. While Prachett's study included significant numbers of casual and heavy gamers, De Schutter's research investigating the use of digital games among 124 older gamers with a mean age of 58.18, counted 16.1% as heavy gamers who played digital games more than 2.5 hours a day; 29.5% were moderate gamers playing 1 to 2.5 hours a day; and 44.4% were light gamers whose time of digital game playing is less than one hour a day (De Schutter, 2011). However, information about mature gamers game preferences, playing time, and choice of game devices is still quite limited but a trend toward growing numbers of older gamers is expected to continue, as more tech savvy baby boomers become retired older adults .

Next, we explore the potential of digital games to enhance the social lives of older adults by reviewing the literature relating to:

- Motivations behind digital game playing
- Social interaction and digital game playing
- Playing Wii Bowling

- Barriers to playing digital games including Wii Bowling

Motivators for Playing Digital Games

Technology can help support and maintain older people to live as well as possible for as long as possible but most of the research to date has emphasized issues of safety and security including fall detection (Sixsmith & Gutman, 2013). Technology can also offer activities that are stimulating, enjoyable, and fun (Astell, 2013), qualities that promote a life that is enjoyable and meaningful as one ages. Entertainment technology is oriented to creating a fun and challenging milieu for play although up to now the primary audience has been young people rather than the growing demographic of older adults. The potential social benefits of digital games for older adults relate to their ability to provide pleasurable opportunities for social interaction that build relationships with others. There are a number of game characteristics that motivate people to play them and part of the attraction of digital games is the feeling of flow that players experience while playing them (Astell, 2013).

Games are also associated with a feeling of immersion, creating a sense of satisfaction that players find enjoyable (Csikszentmihalyi, 1997). Czikszentmihalyi defines the eight characteristics of the flow experience as follows (Csikszentmihalyi, 1990).

1. We confront tasks we have a chance of completing.
2. We must be able to concentrate on what we are doing.
3. The task has clear goals.
4. The task provides immediate feedback.
5. One acts with deep but effortless involvement that removes from awareness the worries and frustration of everyday life.
6. One exercises a sense of control over their actions.
7. Concern for the self disappears, yet paradoxically the sense of self emerges stronger after the flow experience is over.
8. The sense of duration of time is altered.

The experience of flow was documented in the Presence-Involvement-Flow Framework of game playing (Takatalo, Nyman, & Laaksonen, 2008), suggesting that flow is a enjoyable quality of game play that encourages people to continue to play while sustaining a balance between ability and challenge.

The elements of competition, control, entertainment, escapism, and enjoyability have been described as motivations for playing digital games (Jansz & Martens, 2005). According to Janz and Martens (2005) both simulation games where players move up through different levels and sports games stimulate competition. Games can create a world where players can achieve a certain level of control. Jansz and Martens proposed that this sense of control was especially important to teens because of their limited power over their own environment and this may be a concept of significance to the elderly or less mobile older adults who may be facing a similar lack of control over their environment.

Janz and Martens also found games to be a source of entertainment while some players mentioned that playing games helped to cheer them up (Phillips, Rolls, Rouse, & Griffiths, 1995). These findings could have relevance for older people who are facing difficult conditions and situations as they age. Escapism was a motivator closely associated with flow; a feeling which takes game players away from the realities of everyday life (Phillips et al, 1995). Phillips (1995) also mentions the concept of pastime, referring to those situations where players choose to play games to avoid boredom (Phillips et al, 1995). In Jansz and Martens's study, which involved 176 participants playing digital games on a LAN system, players identified sociality as the single most important motivator for playing games, followed by interest (Jansz & Martens, 2005). Relaxation and competition were considered to be the least important motivators for playing games.

Social Benefits of Digital Game Playing

When played with others, games are intrinsically a social experience. Whitcomb noted that social interaction was the most important benefit for older adults playing digital games (Whitcomb, 1990). Whitcomb also noted that feelings of satisfaction and

accomplishment associated with playing a digital game positively affected people's perception of themselves. Over fifteen years ago, Whitcomb identified physical and cognitive benefits such as improved hand eye coordination, manual dexterity, and increased speed with playing the game as possibly enhancing the self perceptions of older adults. More recently, Ijesselsteijn, Nap, deKort and Poels (2007) suggested that gaming could enhance the lives of older adults by providing opportunities for: 1) relaxation and entertainment, 2) socializing, 3) sharpening the mind, 4) more natural ways of interacting. Astell (2013) referred to Nintendo Wii, the game that is at the heart of our study, as one that supports the more natural way of interacting. (The experience of playing Wii Bowling is described later in this section.)

Gamberini et al. examined the user experience of older adults along seven key dimensions including social interaction, playability, immersion, challenge/skills, and clear goals (Gamberini et al., 2009) using a game prototype called Eldergames intended to improve older people's quality of life. The study involved 107 participants who responded to a questionnaires and a focus group over the 12 weeks of testing. Social interaction was defined as the opportunity to create and maintain new relationships. Results showed that 65.8% of the users agreed with the statement "the most interesting thing has been to share my time with other people while playing". Although the emphasis of this study was on cognitive training, the game also promoted interaction that the users found to be a positive social experience. Although this study included a significant number of participants and provided interesting results, the game they used was a prototype, unlike any other more popular games.

A game called Age Invaders was developed to encourage intergenerational family entertainment among grandparents and grandchildren in one location while parents joined in remotely (Khoo, Merritt, & Cheok, 2009). The researchers discovered that older family members were motivated to play Age Invaders because of their interest in increasing social contact with their children and grandchildren, especially when face-to-face contact was not possible (Khoo & Cheok, 2006). This could have implications for promoting bonds among family members who do not live in the same location but welcome the social opportunity to engage with one another. The game was described as a "mixed reality floor system" with an intuitive interface that reduced the barriers to older

players by eliminating the need for a mouse and keyboard which older players found difficult to use. The goals of the game were to facilitate interaction among users with different skill levels using technology to translate familiar physical body movements to play the game. In the game shown in the following figure, two grandparents are playing in an interactive space with grandchildren while two parents have joined the game over the Internet as virtual players. The grandchildren and grandparents each form a team while the parents “balance” the game. Players gained points by picking up items and avoiding laser beams. Research conducted with five teams composed of two older players and two younger players showed that two age groups who would not normally play together could enjoy challenging and competitive play by setting the parameters of the game to suit the abilities of the players. This game structure integrated inclusive design techniques that promoted positive intergenerational social experiences that could help increase bonds between different age groups and among family members but lacked sufficient number of participants to substantiate their claims.

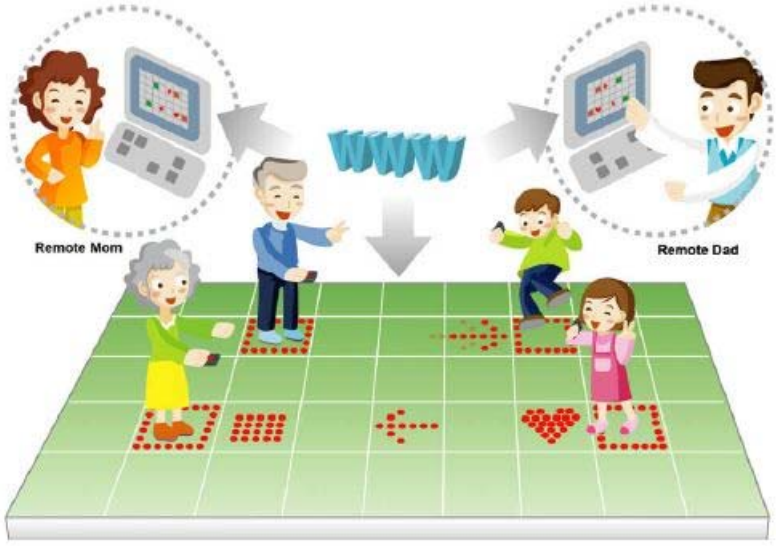

Figure 2-3: Khoo, E, Merritt, T.; Cheok, A. (2009) Designing physical and social intergenerational family entertainment. Interacting with Computers, 21, 76-87. p. 82. Reproduced with permission.

In a larger study of 140 independently living older adults from 63 to 92 with average age of 77.47, results showed older adults who played even occasionally, performed better than non-playing adults on a number of social variables associated with successful ageing (Allaire et al., 2013). Researchers were interested in psychosocial

differences between those who played digital games and those who did not. Allaire et al. assessed psycho-emotional factors including wellbeing, positive affect, negative affect, and depression: domains selected because of their inclusion in Rowe and Kahn's (1998) theory of successful aging. Tests administered included Medical Outcomes Study Short Form-36, The Center for Epidemiological Studies-Depression (CES-D) scale, and Positive and Negative Affect Schedule (PANAS). Players were categorized as regular gamers (n = 48), occasional gamers (n = 37), and non-gamers (n = 48). In order of preference, participants played: digital card games, Wii games (e.g., Wii Bowling), and puzzle games.

Allaire et al. found that regular and occasional gamers significantly differed from non-gamers with respect to wellbeing and negative affect. Regular and occasional gamers had significantly higher levels of wellbeing and significantly lower levels of negative affect as compared to non-gamers. The three groups did not differ significantly for social functioning, self-reported health, and positive health affect. While mean levels of depression were marginal among all three groups regular gamers on the average, showed significantly less depression than non-gamers. Occasional gamers had less depression than non-gamers although this was less significant statistically. Allaire et al. concluded that playing digital games may lower feelings of depression and increase feelings of wellbeing among older adults. They also pointed out these results may have been influenced by recruitment procedures which could have attracted those already interested in playing digital games. They also noted that their participants were generally interested in playing digital card and puzzle games not digital games such as Wii Bowling which implies that most played alone. The study showed that feelings of wellbeing were greater among those who played digital games than those who did not, but the researchers did not explore if and how playing digital games with others might lower the level of loneliness and social connectedness over time.

In a qualitative study focused on gaming websites, De Schutter and Abeele conducted interviews inquiring into the meaning people find in playing digital games (De Schutter & Abeele, 2010). Their interviews of 35 mature gamers between 50 and 72 (M= 61.3) revealed that participants considered playing digital games an enjoyable way to spend time with family, to meet new people, to stay connected with younger people,

learn from grandchildren, compete with children or partners, and overcome challenges with grandchildren and children. The researchers concluded that digital game play provided a means to develop social connectedness with others. Although players felt they did not play as well or as frequently as younger players, they were able to manage the technology and play well and that social connections they made while playing games were an important reason for playing them. This qualitative work shows that perhaps digital games have the potential to support social connectedness among those who play them.

Wollersheim et al. (2010) investigated the psychosocial and physical impact of playing Nintendo Wii in a pilot of 11 older adult women with a mean age of 73.5. Participants first played for a six week period to establish a baseline, followed by a six week intervention where the participants played a game of their choice alone or with others twice a week. The participants were recruited from the groups organized by the community health service offered to older people with disabilities or considered to be socially isolated. In focus groups, the participants reported increased levels of social connection with other players and an improvement in their social and psychological wellbeing. The players noted a closer bond with the other women and expressed a belief that this increased closeness was facilitated through playing the game together. The women also noted that the game helped them to bridge the technological gap between their grandchildren and themselves. They found that learning how to play Nintendo Wii had a positive effect on their self-esteem, reduced feelings of marginalization, and enhanced a sense of connection to contemporary life. Although this very small study was more concerned with physical effect of playing Wii, these results echo results described earlier related to enhanced social connection with others playing digital games.

In a systematic review of peer reviewed literature focused on significant mental, physical and social health factors associated with digital game playing, some studies showed an association with positive social and health outcomes (Hall, 2012). Their search of the literature included PubMed, CINAHL, PsycINFO, Ageline and SPORTDiscus, and Web of Science. The authors excluded reports, commentaries, or studies involving clinical procedures and findings, papers without both male and female

participants, and studies that did not involve digital games as interventions. The resulting 30 studies were examined and reduced to a final collection of 13 studies assessing health outcomes of adults 65+ playing digital games.

Significant positive mental health outcomes were reported in 10 of the 13 studies although the definitions of mental health were quite diverse. Significant social health outcomes such as social interaction and social support were reported in two of the 13 studies. This could mean there were fewer studies in the area of social health than mental health available at the time of the review. Of these 13 studies, the majority used a pre- and post-test, two were pilot studies, one of which used randomized control trials, and only one study included the theoretical basis for their intervention. The number of participants ranged from 6 to 121 (mean number was 32.31 with SD = 28.67). The mean age was 75.38 with SD = 6.84. Nintendo Wii and computer games were the most commonly used devices. Overall, this review showed that researchers have just begun to empirically study the benefits of digital games for older adults. The systematic review also seems to point to a shortage of empirically sound studies on the social benefits of digital games for this age group. Studies relating to mental health that included depression as a factor in social isolation and loneliness were relatively unexplored in this systematic review. It is also interesting to note that only one study was based on a theoretical framework of some kind, for example, gerontological or social psychological theory.

Bell et al.'s study on the relationship of digital games and quality of life is mentioned in the systematic review discussed above. Through a repeated measures design, these researchers assessed the effects of Nintendo Wii Bowling on quality of life, social relationships, and confidence in the ability to prevent falls (Bell et al., 2011). Quality of life was measured using the Control, Autonomy, Self-realization, and Pleasure Scale (CASP-190); social relations were assessed via the Social Provisions Scale (SCA), while confidence to prevent falls was measured through the Modified Falls Efficacy Scale. The study included 21 participants with mean age of 80.8 with eight participants included in group 1, six participants in group 2, and seven in a control group. The small sample size contributed to the limitations of this study, as well as confounding factors such as confusion experienced by some of the respondents when they

completed questions included in the CASP-19 (i.e., those repeated in reverse). In sum, there were minimal significant items across all three groups although the qualitative data indicated levels of overall satisfaction and increased participation. The fact that the Bell et al.'s study was one of two studies included in Hall (2012) et al.'s systematic review which examined the social aspects of playing digital games such as Wii Bowling shows that more work is needed in this area. The second study mentioned in Hall et al.'s systematic review that mentioned the social aspect of playing digital games was primarily interested in cognitive function and included only nine participants— again pointing to limited number and scope of studies in this area.

Marston et al. looked at the advantages and disadvantages of Nintendo Wii for older adults aged 60 years and over in residential facilities in connection with mental wellbeing, social interaction and mental rehabilitation (Marston, 2013b). Their literature search included peer reviewed articles in PubMed, JStore and Scopus, ACM, Internet, and Google Scholar databases from January 2000 to mid January 2012. The following combinations of key words were chosen: Wii OR Kinect; AND older adult OR senior OR elderly Or geriatric; AND care OR health or fitness. Of the 206 articles identified, they discovered six studies which utilized Nintendo Wii console for the purpose of studying wellbeing and physical/social activity in a long term care or nursing home setting. In the discussion of Nintendo Wii activities for promoting physical fitness, mental wellbeing, and social interaction, the Wii environment provided older adults with the opportunity to have control over their surroundings creating a positive impact on their mental state. Furthermore, when older adults played together, they experienced a sense wellbeing and social connection (Marston, 2013). However, as Marston et al. (2013) concluded the studies in their systematic review were limited by their small sample sizes.

A study by Jung et al., included in the Marston review above, found that older people in care facilities playing Nintendo Wii reported a higher level of self-esteem and a higher sense of mental wellbeing than peers who played traditional games (Jung, Li, Janissa, Gladys, & Lee, 2007). This longitudinal study included 45 participants 60+ years of age, 30 of whom played three sessions of Wii over six weeks. The purpose was to study the effect of playing Nintendo Wii on the overall quality of life. The researchers noted the use of avatars in Wii games provided opportunities for interaction enhancing

the confidence of the players as well as encouraged interactions with peers and family members they had not normally played with before. Three instruments were implemented in face-to-face interviews with participants: the UCLA Loneliness Scale Version 3, the Rosenberg Self-Esteem Scale, and the Bradburn Affect Balance Scale before and after the game intervention. The latter was used to measure positive and negative affect among the participants. An independent samples t-test was conducted to evaluate the hypotheses with the following results. Those who played Wii scored significantly higher on positive affect and significantly lower on loneliness as compared to the 15 participants in the control group who played traditional games like Jenga, memory games, and UNO. All games were new to the participants. It was concluded that the overall wellbeing of the participants who played Wii Bowling improved more significantly than those who did not play in terms of reducing the level of loneliness. These results show the potential for digital games to enhance the social lives of older adults as compared to playing traditional games.

A study conducted by Harley et al., also cited in the systematic review by Marston et al. described earlier, is a longitudinal study of 30 participants between 60 and 94 playing ten two-hour sessions of Wii Bowling over one year (Harley, Fitzpatrick, Axelrod, White, & McAllister, 2010). Researchers organized a Bowling league and tournament in small districts around their location in England and players were close enough to play face-to-face with other competing teams. Harley et al. collected participant observations, interviews, and video recordings of the sessions to determine changes in game play. They began by interviewing staff to assess the level of support available to the players and the participants' motivations to take part in the study. Team building and competition was seen as an important to player's engagement. Although these researchers were primarily interested in the empowerment and ownership over their living spaces, they concluded that playing Wii addressed social isolation by offering new social peer connections through community events. This is the first article in our literature review that mentioned the term social isolation specifically. Also, this paper is one of the few reviewed that referred to a theoretical framework that referenced a theory of ageing. This lack of theoretical framework is also mentioned by Bell et al's systematic review described earlier. This was also the only study that mentioned a Wii tournament although unlike our study, all participants met face-to-face to play.

Thirty-five individuals with a mean age of 82 took part in a study inquiring into the levels of physical activity, mood, and loneliness while participating in either playing Wii or watching TV (Kahlbaugh, Sperandio, Carslon, & Hauselt, 2011). All lived in independent living apartments in the US and none were involved in any program using Wii or video games at that time. The four instruments described in the table below were implemented to measure psychosocial impact of each activity. The level of loneliness was determined using the UCLA Loneliness Scale version 3 and the Positive and Negative Affect Scale (PANAS) and both were administered at pretest and post-test intervals. In addition, the Wii group and the TV group completed the PANAS each week.

Sixteen participants were assigned to play Wii game of their choice (all selected Wii Bowling) and twelve participants were assigned to watch television for one hour per week for 10 weeks. Research Assistants either played Wii or to watched TV with the participants throughout this time period. Seven participants served as “no visit” controls who were not visited by a Research Assistant to control for the effect their visits might have on the participants. Everyone completed all measures in Weeks 1 and 10 as well as the PANAS and Weekly Physical Activity scale each week.

Conducting pre vs. post-tests with three groups using the UCLA Loneliness Scale, their analysis revealed significant interaction. Participants in the Wii group had lower loneliness scores at post-test, while the TV Control group showed higher levels of loneliness at post-test. Again, this is a comparison of different types of activities and their ability to enhance the quality of life.

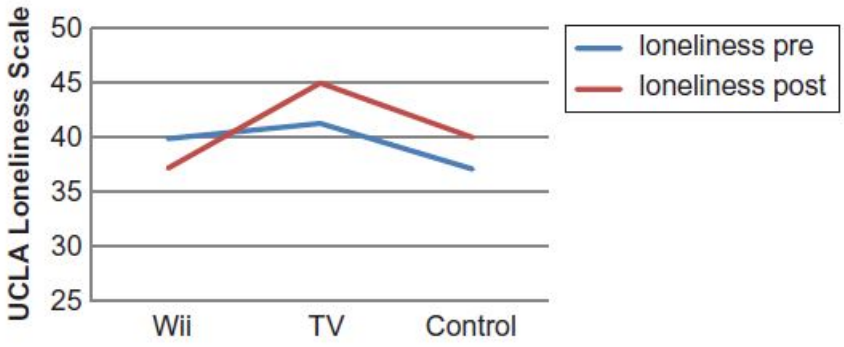

Figure 2-4 Group differences in pretest and posttest loneliness scores (Kahlbaugh, 2011) pg 337

In conclusion, those who played Wii Bowling reported decreased loneliness while those who watched television reported increased loneliness in this study. From week to week, the group that played Wii reported a greater positive mood than the television group. These researchers suggested that playing Wii created a common social network in their residence that increased the sense of community. They also suggested if the higher level of loneliness among the television group might be attributed to a feeling of being excluded from the Wii group. Although positive mood was higher in the Wii group, over the ten weeks, the levels declined and appeared to fade with time. There was no increase in the level of life satisfaction as a result of playing Wii. The authors recommended Wii as a recreational activity for increasing a sense of belongingness and enjoyment.

Voida and Greenberg's study is concerned with intergenerational interaction that occurs when playing co-located console games (Voida & Greenberg, 2012). The authors viewed intergenerational interaction as critical to expanding the diversity of people the elderly meet and the development of supportive relationships that can lessen social isolation as they grow older. Voida and Greenberg examined the use of console games as a bridge between four generations of 36 participants. Participants completed a questionnaire about their previous experience playing digital games and game platforms and were observed at play. Researchers compiled field notes and video recorded these sessions. Players also joined a focus group where they discussed sketches they had

made depicting their ideal playing environment, their motivations for playing, and their game play preferences. During the study, participants played between 30 minutes and two hours: an average of an hour and 15 minutes at a time.

Although there appears to be a high level of agreement among the literature presented in this section that there are positive social benefits for older people playing digital games, the goals and parameters of each study vary considerably and some studies involve small groups of participants. Only one study focused on loneliness specifically when comparing those who watched TV with those who played Nintendo Wii (Kahlbaugh et al., 2011). Although the largest study shown in the table below (Allaire et al, 2013) administered the UCLA Loneliness Scale, it was used as an instrument to measure the difference in the quality of life among those who played digital games, primarily digital card games which tend to be single player games, as compared to those who played traditional games. In their paper, Allaire et al (2013) wondered if the differences in the two groups may have been more pronounced if more participants had played more dynamic immersive games. In the studies reviewed here, a majority used Nintendo Wii, a more socially oriented game, but the numbers of participants tended to be small overall. The age of the participants varied but most did not include many participants who were over 80 years old. This is significant since the most elderly are more likely to experience social isolation and loneliness, and including more participants in this age group in studies about the social benefits of digital gaming could show interesting results in terms of loneliness and social connectedness.

Table 2-1. Summary of the Study Criteria and Parameters Reviewed in this Section

Study	# of participants and mean age	Game device	Main focus of study and methods
Gamberini et al., 2009	N = 12, 68.08	Eldergames prototype	Usability Video analysis, checklist completed by observers
Gamberini et al., 2009	N = 107, mean age not clear	Eldergames prototype	Usability, cognitive function. Video analysis, checklists completed by observers, and questionnaires on level of flow.
Khoo et al., 2009	N = 20, children and grandparents	Age Invaders prototype	Enjoyment, playability, intergenerational play.

Allaire et al., 2013	N = 140, mean age 77.47	Those who played digital games vs. those who do not play digital games	Wellbeing, positive and negative affect, and depression. Medical Outcomes Short Form-36, Center for Epidemiological Studies-Depression (CES-D) scale, Positive and Negative Affect Schedule (PANAS). Pre test only.
De Schutter & Abeele, 2010	N = 35, mean age 73.5	Unknown variety	Meaning of games. Interviews and observations.
Wollersheim et al., 2010	N = 11, mean age 73.5	Nintendo Wii	Physical and social effects of exer-gaming. Focus group study.
Bell et al., 2011	N = 21, mean age of 80.8	Nintendo Wii	Quality of life (CASP-180 scale), social relationships (CSA scale), and skills to prevent falls. Repeated measures.
Jung et al., 2007	N = 45, 60+ years of age	Nintendo Wii vs. traditional games	Quality of life including self esteem and mental wellbeing. UCLA Loneliness Scale V3, Rosenberg Self-Esteem Scale and Bradburn Affect Balance Scale completed pre and post intervals.
Harley et al.,2010	N = 30, mean age not stated but between participants were between 60 to 90 years	Nintendo Wii	Promote physical and social activity. Observations, interviews, and video analysis over a year.
Kahlbaugh et al., 2011	N = 35, mean age 82	Nintendo Wii vs. watching TV	Physical activity, mood, and loneliness. UCLA Loneliness Scale, Positive and Negative Affect Scale completed at pre and post intervals.

Most psychological studies have focussed on cognitive and physical benefits of playing video games center on physical control and cognitive function (Allaire et al., 2013) rather than the level of loneliness and social connectedness. Often game research is interested in the experience of children and adolescents (Granic, Lobel, & Engels, 2014) rather than the benefits or drawbacks for older players. Also, early research focused on the impact of violent online video games on younger audiences (Boyle, Connolly, & Hainey, 2011) perhaps as a result of public concern about aggressive behavior and social isolation among these younger people. As result there are very few studies of the impact of pro-social non-violent video games and most are focused on children (Anderson, Gentile, & Dill, 2012).

Although research is limited, there appears to be evidence that there are significant social benefits associated with playing digital games with others. However, there are constraints for older people who wish to play digital games that may inhibit these positive benefits. Some of these barriers are discussed next.

Barriers for Older Digital Game Players

Providing enjoyable and interesting leisure activities to older adults is a serious challenge within the domains of care and technology (Bouwhuis, 2006). Age related changes and disabilities can inhibit the participation of older people in social and physical activities (Lindley, Harper, & Sellen, 2008). If digital games might be better designed and implemented they may have the potential to foster positive social situations among the elderly that enhance the quality of life (Lindley et al., 2008). This section describes the physical and attitudinal factors that influence the adoption and interaction by older people with digital games as well as recommendations for more inclusive designs suggested by some researchers.

Bleakley et al. conducted a systematic review of the physical and cognitive effects of interactive computer games (ICG) in those over 65 years old within the period from 2000 to 2011 (Bleakley, Charles, Porter-Armstrong, McDonough, & McCormack, 2013). The games varied in terms of software, game type, and interaction. In their review ICG was defined as “any kind of computer game or virtual reality technique where the participant could interact with virtual objects in a computer-based environment” (p. 3). Physical attributes of games included aerobic, strength, balance, and flexibility. While no significant negative effects were discovered, the review showed that improvements to ICGs could enhance the game experience for older people.

Although physical activity has been shown to enhance the quality of life, barriers such as lack of guidance, lack of role models, fear, preferences, and lack of social support limit participation in physical activity (Allender, Cowburn, & Foster, 2006). It is possible these same barriers could also impede the level of participation by older adults in interactive computer games especially those that require a higher levels of dexterity, balance, and strength. Inappropriate 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, McLaughlin, & Allaire, 2011). When a technology is user friendly and not too difficult to use, and suited to the user's requirements, older players are more likely to adopt and enjoy the experience of using it (Sauve, Renaud, Kaufman, & Duplaa, 2015). Marston lists three barriers to the use of technology by older people: 1) lack of instructions for the game and equipment, few incentives to invest their time in using technology, and the low value of technology in their lives (Marston, 2012). Additionally, older people may feel that playing digital games may not be appropriate for someone their age (De Schutter & Abeele, 2010). Marston (2013) suggests those designing games for an ageing society should address these issues and including older people in the design process would help to contribute to better usability for this age group.

The choice of consoles can impact game play if they present barriers to older players as Marston found when she compared the Nintendo Wii and Sony PlayStation2 consoles (Marston, 2013a). Her study included 68 participants with a mean age of 57 years who used either Nintendo Wii with a remote or PS2 with a game pad to play Wii golf, tennis or boxing. By measuring the level of flow, Marston concluded that the interaction on the Wii remote was easier to use than the game pad on the PS2 console.

Some researchers have studied the physical barriers to playing digital games due to age-related changes such as problems with balance, reduced coordination and dexterity, and issues with vision and hearing (Czaja & Lee, 2008). Some findings suggested that readily available commercial digital games are not easily accessible to the frailest elderly (Gerling & Schulte, F. & Masuch, M., 2011). Gerling (2011) also noted that most design recommendations for older players do not focus on user-friendly games for the frailest older adults who face the most obstacles to playing them. Gerling's study of a digital game, SilverPromenade, developed for the Nintendo Wii and designed for this age group, included 18 people in two groups with average ages of 80 and 81 living in full care homes with 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. A short questionnaire showed that training participants

beforehand provided a better experience for these players and that previous game experience can have a positive effect on game performance. Gerling concluded that the participants were able to learn and use new technologies despite their physical limitations although there were some issues with game control. Gerling's findings appeared to show that the Wii remote could be better designed if there were no small buttons and time-based interactions. In data collected through observations, this research indicated that using the Wii remote for pointing activities posed barriers to those with more severe issues with coordination and dexterity.

McLaughlin et al. viewed the potential advantages of playing digital games within the context of a cost/benefit analysis shown in the following figure (McLaughlin, Gandy, Allaire, & Whitcomb, 2012). 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 barriers encountered during gameplay (McLaughlin et al., 2012). McLaughin et al. described the costs as perceived by the participants playing a game called BoomBox. Data was collected through discourse analysis of comments by 30 players aged 65 and older (mean age = 82) who had played a variety of digital games including Wii Bowling previously as well as analysis of video recordings of game playing sessions. The researchers observed that players had trouble seeing elements of the visual interface and maintaining control over the interface with the remote.

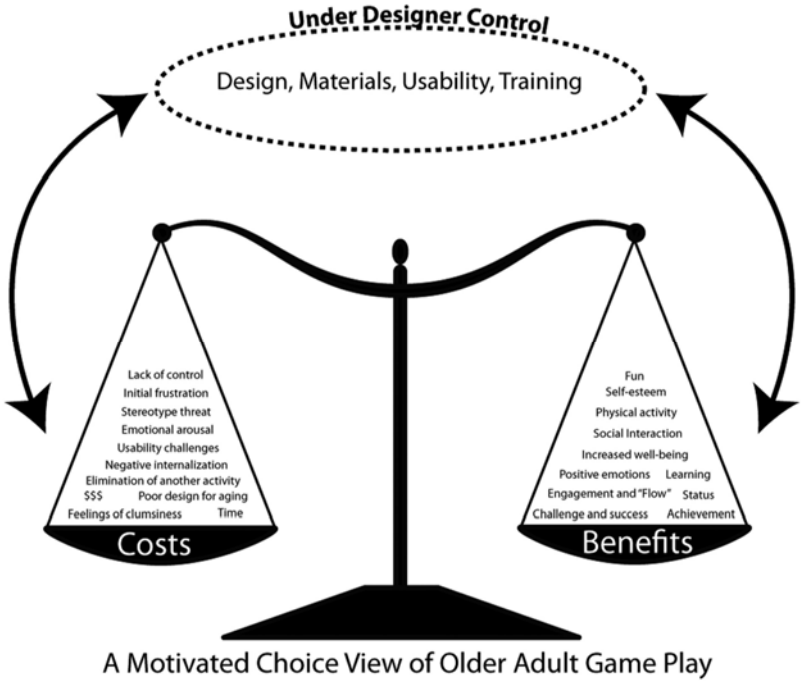

Figure 2-5: Potential costs and benefits perceived by older adults when making a motivated choice to play video games. Design of the games, supplemental materials, usability, and training are variables that affect both costs and benefits and are under the control of the game developers and testers. (p. 13) (McLaughlin et al., 2012)

Nevertheless, benefits can be more important to ageing individuals than the costs of poor design (Sharit, Czaja, Perdomo, & Lee, 2004). Older adults may be simply unaware of the various advantages of playing digital games, and therefore accentuating and promoting the benefits may encourage more seniors to play. McLaughlin et al. concluded that simple interaction, low physical demands, engaging experiences, social component, reward system, and in game scaffolding all increase accessibility and the opportunity of older people to enjoy the benefits of digital gaming.

McLaughlin et al. also discuss the concept of "stereotype threat" that brings about the expectation of failure. In other words, older adults may feel they will not be able to understand the digital games or like them (Schultz, 2006). This attitude may hinder older adults from playing digital games and prevent them from enjoying the social benefits they offer. IJesselsteijn et al. also comment on this phenomenon and the functional limitations of older people, recommending that older players offered positive feedback on learning goals rather than performance goals increases their sense of self-

efficacy that allows them to achieve some level of success (IJsselsteijn, Nap, de Kort, & Poels, 2007). These authors see the benefits of social interaction associated with playing digital games, to be a strong motivation for older players to engage in digital game playing and suggested that if game designers were aware of the usability issues faced by seniors and addressed them, this age group as well as others might benefit from this improved accessibility.

Hwang et al.'s study was also interested in the design of digital games for older adults and produced and evaluated an embodied interactive video game (EIVG) that integrated human physical movement (Hwang, Hong, Hao, & Jong, 2011) similar to the human computer interaction experienced in Wii Bowling for example. This game design responded to the impact of ageing on physical abilities as well as anxiety about learning new technologies. Players interacted with animations via a webcam using their body movement to interface with the game system and no remote or keyboard was needed. The first game play involved categorizing food for health, the second game was about identifying the symbols of Asian and European countries, and the third game was based on speed of movements made during the game. Thirty people 60 plus years of age from rural community, elementary school volunteers, and a nursing home were interviewed and observed. The purpose of the study was to understand the usability and dependability of the game system. The study found evidence that this kind of interface reduced player's physical barriers. Players were able to move any part of the body and eliminating the need to manage a remote and buttons while playing the game reduced the need for higher levels of coordination (Hwang et al., 2011).

Acquiring technical proficiency can be a source of anxiety for older people who are playing digital games for the first time (Wollersheim et al., 2010) and usability issues can present obstacles to player's enjoyment of Wii Bowling such as button controls and barriers presented while playing from a chair (Neufeldt, 2009). Nevertheless, Voida et al. described playing Wii as a computational meeting place for older people to establish social contacts with peers and to experience intergenerational play (Voida & Greenberg, 2012). Research has shown that both peer-to-peer mentoring and learning in informal environments can create the circumstances that enhance computer literacy (Selwyn, 2005) and this could also promote the learning of digital games themselves and in the

process reduce the anxiety around technology and increase feelings of self efficacy and self confidence among older people.

In summary, older adults can experience barriers to playing digital games that prevent them from reaping the social benefits they might enjoy. Designing games that consider the needs of older players could reduce these barriers and provide leisure options for the elderly. Despite these barriers, older people can learn to play and enjoy playing digital games.

Summary

This literature review sets the stage for this study by describing an interest in supporting a continuing quality of life into old age in light of the growing numbers of older adults. Within an active ageing framework, policies and programs that promote mental health and social connections are as important as those that improve physical health status (WHO, 2002). Indeed, a positive link has been drawn between social relationships and mortality (House et al., 1988).

Digital games may have a role in developing and building relationships among older people and reducing loneliness and social isolation. Older persons enjoy playing games for a number of reasons but the sociality of gaming is one of the more important reasons why they play digital games (Jansz & Martens, 20005). Despite the possible barriers to playing digital games, older players do find that the benefits of playing can outweigh the drawbacks of inappropriate game design and equipment that are difficult for mature players to use (McLaughlin et al., 2012).

To date studies about the social benefits of digital gaming have tended to be quite small and not firmly rooted in a theoretical framework. The next chapter describes a Wil Bowling tournament implemented as a vehicle to study the social effects of playing digital games and how this experience may have enhanced their social lives and reduced the feelings of loneliness and social isolation.

Chapter 3. Methods

Introduction

This study examined the impact of playing digital games on the social life of older adults by implementing a city wide Wii Bowling tournament at a number of centers in the metropolitan area. This chapter explains the decision to use Wii Bowling within this competitive context and the methods we deployed to collect quantitative and qualitative data and conduct the data analyses.

The Wii Bowling Tournament

Our research focused on a digital game that many have played or are familiar with, Wii Bowling, published by Nintendo in 2006. Wii Bowling is one of a suite of games called Wii Sports which has sold over 82 million units and is one of the best selling games of all time (Nintendo Investor Relations Information, 2014). The Wii remote device contains sensors that detect natural body movements that are mirrored within the game play itself.

When playing Wii Bowling, the players use a handheld controller to simulate the motions that occur in an actual Bowling game. Virtual Bowling can allow older adults to participate in activities in which they may no longer be able to do for a variety of reasons: lack of mobility or strength for example. The game can occur at home and there is no heavy ball to lift and throw. Kahlbaugh refers to the Wii game activity as a ‘compensatory strategy’ that enables people to continue to play games they enjoyed when they were younger (Kaulbaugh, 2011).The design of Wii games also permits co-located individuals to play together on one console creating new opportunities for social interaction, appealing to groups such as older adults who typically did not play digital games before the advent of Wii Sports (Theng, Truc, & Truc, 2010).

Wii avatars, called Miis, display real time visuals representing each player, may also enhance engagement in the game and possibly foster social interaction (Jung,

2009). Players can enter nicknames and customize the appearance of their Mii avatar. Players enjoy these activities and they help promote the adoption of the Wii game technology as a recreational activity (Harley et al, 2010). The Wii system also keeps track of scores so players can track their progress over time as players compete with one another or with themselves. Game preferences are dependent on personality and current and past experiences of the participants (Allaire, 2010). As well, Wii games do not require a high level of visual acuity which may be important for some older players (Allaire, 2010).

The next figure shows the equipment set up in our study on the left and a close up of the Wii console and controller used on the right.

Playing Wii

Wii Equipment

Figure 3-1: Wii Bowling set up and equipment

The format of a Wii Bowling tournament was selected to: 1) encourage people to join the project 2) create a venue traditionally associated with bowling; and 3) provide a motivating team setting that offered cooperative gameplay. Research has shown cooperative learning offers social benefits such as improving relationships, facilitating learning new skills, and enhancing the ability of working with others but these goals can only be achieved when there is a group goal that is important to those in the group

(Slavin, 1988). Competing in the tournament may provide that essential common group goal that leverages these benefits.

Wii Bowling offered a convenient platform for multiple players where bowlers can use one or more controllers, and the game action is displayed on a large screen. We selected the Wii Bowling game for our research because: 1) many older adults are familiar with Bowling; 2) the game is enjoyable; 3) the game is relatively simple to learn and play; 4) Bowling is a social activity.

Those recruited to play in the tournament were organized into teams. Most research sites provided one team of four participants although some provided two teams of four participants. In a few cases we accepted a team with only three players. The teams participated in a Bowling league and played two Wii Bowling games each week during an eight-week tournament. The teams were expected to practice informally during the week between 'official' tournament games. Teams played against one another in the tournament and scores for each team were posted weekly on a website and provided on paper each week by the Research Assistant working at their site, as not all players used or had access to computers and the Internet. Winning teams received prizes: $500 for first prize, $250 for second prize and $100 for third prize which was divided among the four players in each team. The Wii equipment and monitor was provided to the research sites if required.

In the first session together, Research Assistants trained participants to set up equipment, play Wii Bowling, and helped them create their own Mii avatars. We strongly encouraged weekly practice. Each team then played two Wii games once a week for eight weeks at which point, we administered the post-questionnaire to those who had played in the tournament.

Since older adults may have appointments or commitments or suffer health issues that prevent them from attending every session, only the team's top three scores were posted each week even if four players attended that session. This approach allowed some flexibility when one team member was absent. In one case, team members dropped out from two teams at one center so the remaining team members were combined into a team that continued playing to the end of the tournament.

Research Design and Rationale

Our research methodology is a mixed methods approach that included quantitative and qualitative research methods. The quantitative research method implemented was a quasi experiment in which we could measure the change in the level of friendship, loneliness, and social connectedness among players both before and after an eight-week Wii Bowling tournament in order to assess the social impact of this activity.

The qualitative research method implemented consisted of semi-structured interviews undertaken with a small group of players who were also interviewed briefly towards the beginning of the tournament and more extensively immediately after the tournament. This mixed methods approach, combining both quantitative and qualitative research techniques, was chosen to take advantage of the strengths and to overcome the weaknesses of each approach. As well this approach was considered to be the most appropriate to answer the research questions. To recap, the research questions were as follows:

1. Does playing a digital game, Wii Bowling, with peers in a tournament reduce older adults' feelings of social isolation and loneliness?
2. What do older adults perceive as benefits of playing the digital game, Wii Bowling, in the tournament?
3. What do older adults perceive as barriers to playing the digital game, Wii Bowling, in the tournament?

Case Study Research Framework

The approach to our qualitative work was defined and developed using the case study research model which involved the study of an issue investigated through a particular case within a bounded system (Creswell, 2007) set by the boundaries of a specific setting or context. Our case study is bounded by a specific event, the Wii bowling tournament over an eight-week period and was studied through detailed, in-depth, data collection that included several different sources of information about the participants. For our research this included quantitative and qualitative sources such as questionnaires, interview transcriptions, member checking and a report on the coding procedures employed when analyzing the transcriptions.

In this chapter we document and report a case description based on these various sources of data. As defined by Stake (1995), our case is a single instrumental case study that focuses on a particular issue, in this instance, social impact of digital game Wii bowling on older adults. Our case study has clearly identifiable boundaries and seeks to attain an in depth understanding of the case at hand: the Wii bowling tournament that took place over an eight week period.

Our data takes both a qualitative and quantitative approach (Yin, 2003) that shows different perspectives of a single instrumental case study (Stake, 1995) centering on the use of playing digital game, Wii bowling, to enhance the social life of older adults. Through data collection, a detailed description can be assembled focusing on a few key issues or themes that, although can't be generalized beyond the case, advance the understanding of the case itself and explore the meaning of the issue being studied. Analysis includes a detailed description of the case and its setting by establishing patterns and looking for the relationships between these patterns. The final interpretation constitutes the "lessons learned from the case (Lincoln & Guba, 1985).

Next we discuss the mixed methods research approach we deployed to collect research data.

Mixed Methods Research Approach

Our study employed a mixed methods approach to collect information needed to answer our research questions. This approach combines qualitative and quantitative data collection and intertwines stories or opinions with statistical data to study social problems. By integrating these two approaches, researchers can expect to achieve a better understanding of the social issue under study than by either quantitative or qualitative data alone (Creswell, 2013). To implement mixed methods research, the researcher selects the timing of each method as well as the priority of each method within the overall research design to ensure the research problem will benefit from a suitable mixed methods approach.

One example of a suitable match between a research problem and a mixed methods approach is when a researcher seeks to better understand experimental scores

by gathering information about the participants' perceptions of the phenomenon under study (Creswell & Plano Clark, 2011). This played a significant role in our decision to pursue a mixed methods approach, which included a quasi-experimental design with pre- and post-questionnaires as well as in-person interviews conducted with a small subset of participants. In this chapter we justify our mixed methods design and describe the implementation of several data collection strategies.

Our study is a concurrent/triangulation mixed methods design where data collection was carried out within the same time frame, results reported individually, then merged into a larger understanding in our final analysis (Creswell & Plano Clark, 2011). Each method was carried out from January to March 2014 and considered of equal importance to the study.

Two almost identical questionnaires were distributed to players at two points in time: before they began to play Wii Bowling and after they had completed playing in our tournament eight weeks later. The only difference was the demographic data and questions about video game experience collected in the first questionnaire. Interviews followed a similar pattern.

A small group of participants were interviewed twice: first on the phone for about 20 minutes at the start of the study, then in person in their center or residence after the tournament was complete. There were also other secondary sources of data collected throughout the tournament including field notes, attendance, weekly observations, and five minute personal interviews each week after the game session but these data were not analyzed and included in this thesis as they did not directly address the research questions. Also, we did not consider videogame experience data for this same reason.

Quantitative Work: Quasi Experimental Intervention

The quantitative study attempts to answer our first research question.

> *"Does playing a digital game, Wii Bowling, with peers in a tournament reduce older adults' feelings of social isolation and loneliness?"*

This study implemented a quasi experiment involving a pre-test measure followed by an intervention and a post-test measure for a single group (Bryman & Teevan, 2005). In our study the Wii Bowling tournament is the intervention; the Wii Bowling players, the single group who completed both the pre- and post-questionnaires. These participants were self-selected as it was impossible in our context to randomly select them and there was not an equivalent control group because of the financial cost of Research Assistants' time and the expense of recruiting further participants. This design does pose a threat to internal validity but can provide a useful comparison to better understand the phenomenon at hand (Bryson & Teevan, 2005) but as such has low external validity, i.e., generalizability.

In this quasi experiment, we asked players and non-players to rate their agreement with statements relating to friendship, loneliness, and social connectedness, before they began playing and after the end of the tournament. These data were used to investigate changes in perceptions of friendship, loneliness, and social connectedness during this eight-week period. The instruments, procedures, and analysis are detailed later in this chapter.

Qualitative Work: Semi Structured Interviews

The qualitative study addresses two research questions:

"What do older adults perceive as benefits of playing the digital game, Wii Bowling, in the tournament?"

"What do older adults perceive as barriers to playing the digital game, Wii Bowling, in the tournament?"

These two research questions were explored through interviews with participants that elicited players' perceptions and opinions of their game playing experience. For example, we asked about players' reports of connections and friendships they formed during the tournament, their conversations with friends and family about the involvement in the tournament, the barriers and benefits they encountered when playing Wii Bowling, and how they overcame these barriers. In essence, the qualitative work illuminated the quantitative results.

In summary, the intervention of a Wii Bowling tournament was studied through detailed, in-depth, data collection that included several different sources of information about the participants from sources including questionnaires and interview transcriptions. Member checking and a report on the coding procedures employed were also undertaken to help improve the accuracy, credibility, validity of the results.

Ethics

Ethics approval for this research was obtained through an application to the Simon Fraser University Ethics Review Board by the Principal Investigator of the project, Dr David Kaufman, University Professor, Faculty of Education at Simon Fraser University. He is the Principal investigator for the Ageing Well project funded from 2012-2016 by the Social Sciences and Humanities Research Council (SSHRC).

Consent and Recruitment

We identified and then contacted senior's residences and community centres in several large municipalities in the Greater Vancouver area in British Columbia (BC) including Vancouver, Burnaby, Surrey, White Rock, West and North Vancouver to ascertain interest in joining our research study by adding Wii Bowling into their existing programs. The Research Coordinator contacted the recreation coordinators at each site by telephone and email to introduce them to our project. If the Recreation Coordinator indicated their center would be interested in participating in our research, the Research Coordinator sent an invitation letter and a letter of permission for the center administrators to sign. Once permission was granted by the centre, a site visit was scheduled for the research team to set up an information table to recruit participants for the study and form teams for the Wii Bowling tournament. We provided the Recreation Coordinator at each center with brochures and posters to advertise the dates, times and locations of our recruiting visits. In some cases, volunteer social coordinators distributed promotional materials on our behalf. We then visited those centers that agreed to allow us to set up a table to invite residents to join our research study.

Seven Research Assistants were involved in the data collection phase and each was assigned to one or more centers. During their first site visits, the Research Assistants described our research and provided consent forms to those who wished to play Wii Bowling. We offered a small incentive of $40 to be a participant and complete the pre-post instruments, cash prizes of $500, $250, and $100 for the teams that placed first, second, and third in the tournament. We also took the opportunity during recruiting sessions to form the teams that would compete in a Wii Bowling tournament. Eighty participants were recruited.

Twenty players from the group who consented to play in the tournament agreed to take part in the qualitative study consisting of two interviews although only 17 interviews were eventually analyzed. Confidentiality was maintained in this study and no one is identified by name or location in this dissertation or others publications and presentations. Documents are kept in a secure cabinet in the researcher's office and will be destroyed in two years.

Participants

Participation was limited to those who were 60 years of age or older. Since dementia could be a confounding factor in the results, none of those recruited had been diagnosed with this illness, to the knowledge of the researchers, and participants were screened by staff at the centres. As well, at least two Research Assistants attended each week and observed participants carefully to assure themselves that their cognitive function was in the normal range. Demographic information collected before the intervention is presented in Chapter 4.

Settings

Participants who participated in the tournament were recruited from 14 centers where older adults lived or frequented in the Vancouver Lower Mainland area including independent living centers, senior recreation centers, and assisted living centers. Independent living centres offer apartment living for those over 55 years of age, while assisted living centres offer additional services to residents such as meals,

housekeeping, laundry, recreational opportunities, 24-hour response lines, and personal care services. Recreation centres are community facilities that offer opportunities to join leisure activities.

Those who were interviewed as part of the qualitative study were recruited from an area comprised of three adjoining municipalities. Twelve participants were recruited from independent living centers and five others from assisted living centers.

Data Collection

Through our mixed methods approach, data collected included quantitative survey results that included 73 players and recorded interviews with 17 participants.

During each Bowling session, Research Assistants ensured that participants played two full games of Wii Bowling. The Research Assistants recorded the scores and posted them on a tournament website and announced the next game date and time. They also encouraged practice during the week between sessions. We also extended invitations via the social coordinators encouraging others to attend as audience members at our weekly Bowling sessions.

At the end of the final tournament session, Research Assistants did the following:

- Administered the post-questionnaire
- Administered the last game evaluation survey
- Announced scores, winners, and prize winners
- Distributed honoraria to participants who completed pre- and post-questionnaires and who played the game throughout the tournament period

The instruments are described in detail in the next sections.

Pre- and Post-Questionnaires

The aim of our pre- and post-questionnaires was to measure the levels of friendship, loneliness, social connectedness before and after the Wii tournament. The pre-questionnaire was administered by a Research Assistant once participants after all participants had signed their consent form but before players received their training session on the Wii equipment. There were a few questions from participants while they were completing the questionnaire but most found the questionnaire straightforward to complete in about 15 minutes. Each Research Assistant reviewed each questionnaire to ensure all pages had been completed and then discussed the team formation and the schedule with those who were playing in the tournament.

The pre-questionnaire contained several sections. Section 1 collected demographic information such as age, gender, residence, city, and living arrangements; Section 2 collected data on participants' digital and non-digital game-playing history and game-playing skills; Section 3 included questions about the participants' views on playing video games, Sections 4 to 6 included questions that explored participants' friendship, feelings of loneliness, and social connectedness. The post test included Sections 2 to 6.

Sections 4 to 6 were based on three existing social scales: Hawthorne's Friendship Scale and Social Connectedness Scale, UCLA Loneliness Scale (V3), and Overall Social Connectedness Subscales.

Hawthorne's Friendship Scale is a short scale measuring perceived social isolation developed for older adults recruited from supported accommodation, hospital outpatient facilities, older veterans and a randomly chosen group drawn from a telephone directory. (Hawthorne, 2006). The original items measure six dimensions contributing to social isolation including the ease of relating to others, feeling isolated, having someone to share feelings with, finding it easy to get in touch with others, feeling separate from other people, and being alone and friendless. The response categories are "Almost always/Most of the time/About half the time/Occasionally/Not at all". The timeframe is the past four weeks. Each item is scored 0-4. The score on the instrument is the sum of all six items, with a possible range for total score of 0-24 with higher scores

associated with low degree of perceived social isolation. Reliability is reported to be high. Those who are very socially isolated show scores in the lowest range while those with those who are very socially connected score at the highest range.

In our adapted version, items were posed in the present tense, and to maintain consistency among instruments, the respondent selected from five point Likert Scale from “Strongly Disagree” to “Strongly Agree”. For example, in Hawthorne’s Friendship Scale the statement was, “It has been easy to relate to others” followed by a range of possible responses from “Almost Always” to “Not at all”. In our version, this statement was adapted to the following, “I find it easy to relate to others” and choices ranging from “Strongly Disagree” to “Strongly Agree.”

The UCLA Loneliness Scale (V3) which measures social and personal levels of relationships is considered to be highly reliable in terms of internal consistency and test-retest reliability. The scale includes 20 items of which participants can choose among “Never,” “Rarely,” “Sometimes” and “Always” with scores ranging from 1 to 4 respectively. Higher scores demonstrate higher levels of loneliness. The UCLA Loneliness Scale, designed to measure loneliness among college students in the US (Russell, 1996), has been considered a standard tool for this purpose. Studies of the psychometric properties of the UCLA scales, particularly the R-UCLA, have reported internal consistency and test–retest reliability, convergent and divergent validity, and construct validity (Penning, Liu, & Chou, 2014). The UCLA Loneliness Scale, although originally used with younger adult samples, has been used with older people as well.

We decided to change the structure of the original scale from a question to a statement to provide consistency among the three instruments included in the questionnaire so they were presented in a similar structure. For example, the question, “How often do you feel that you are “in tune” with the people around you?” in the UCLA Loneliness Scale was adapted to “I feel that I am “in tune” with the people around me.” Rather than asking the participants to choose “how often” on a scale of 1 (Never) to 4 (Always) as in the original scale, the respondent indicated their agreement with the statement on a five point Likert scale from “Strongly Disagree to Strongly Agree”.

Our third section in the pre and post questionnaire was the Overall Social Connectedness Subscales (Van Bel, Smolders, IJsselsteijn, & de Kort, 2009) adapted from the Specific Connectedness Dimensions developed by IJesselstijn and de Kort, created to address the need to measure the subjective experience of belonging and relatedness in relation to computer mediated communication like email, social media, and texting. They maintain that new communication technology has broadened our concept of interpersonal connectedness (Van Bel, IJsselsteijn, & de Kort, 2008).This scale captures two types of social connectedness 1) one's whole social network and 2) social connectedness at the individual level (Van Bel et al., 2009). This questionnaire collects data about social relationships and social contacts within a personal social network. Contacts were defined as conversations and communication or through media such as telephone, chat, email, text messaging and other electronic media. The scale is composed of six categories of 22 items: 1) knowing the other's experiences, 2) dissatisfaction with contact quantity, 3) satisfaction with contact quality, 4) dissatisfaction with contact quality, 5) relationship salience, and 6) shared understanding. In our adaptation of this scale, we used twelve items and changed two items in the category of Shared Understanding from positive statements to negative statements to balance the number of positive and negative statements. Participants again selected their response from a five-point Likert scale that ranged from "Strongly disagree" to "Strongly agree". The entire questionnaire for our research is shown in Appendix A.

The internal consistency coefficients (i.e., Cronbach's alpha) for each scale were calculated and proved to be acceptable. The following table shows the results for all three scales:

Table 3-1 Internal Consistency Coefficient for Each Scale

Scale	Pre-test	Post-test
Friendship	.72	.81
Loneliness	.91	.92
Social Connectedness	.83	.78

Qualitative Interviews

We also conducted in-person interviews with players who volunteered to take part in the qualitative portion of our study. The first short interview was conducted with these participants on the phone before or just as the tournament started. The goal of the interview was to learn more about how established the participants were in their community, their perceptions of the friendliness of their current living accommodation as well as their involvement in other regular organized activities. We were also interested in their perceptions of video games and their general feelings of psychosocial situation before they began playing Wii. The following questions were asked in the short pre-tournament telephone Interview protocol:

1. What is your **n**ame, location and date
2. How long have you been living in this city?
3. How long have you lived in this neighbourhood?
4. Is it easy to meet people in the centre where you live now? (Probe further if yes or no.)
5. Tell me about your social life in the past month.
6. Tell me about your contact with friends or family in the past month.
7. What kind of things did you do when you're with your friends in past month?
8. What do you think of video games?
9. How have your felt socially and emotionally in the past month? (probe about personal feelings of loneliness or social isolation)

After the tournament, those in the qualitative research study were interviewed a second time in person at their center or in their home. Each interview was about 30 minutes long and covered topics designed to elicit perceptions of the game playing experience and the formation of friendships or social connectedness with their team members, their family and friends, and others in their centers due to playing in the Wii Bowling tournament. The interview protocol follows:

1. Why did you decide to be part of the study?
2. Did you find playing Wii Bowling a positive experience? If so, how?
3. Now that you played Wii Bowling, do you think others would find playing Wii Bowling was a positive experience? Why or why not?

4. Do you think there might be some drawbacks for others playing Wii Bowling?
5. Did playing Wii Bowling have any effect on your social life? What kind of effect?
6. Did you find the social aspect of playing Wii Bowling enjoyable? How?
7. Did you make new or become better friends with your team members?
8. Did you do some things with team members you got to know through Wii Bowling? What kind of things did you do?
9. What was the reaction of your friends and relatives when they told them you were playing Wii Bowling?
10. Did playing Wii Bowling help overcome or relieve some of your real life problems either by distraction, or having fun, or anything else?
11. What did you think of the tournament? (competition was fun? found it stressful?)
12. Were you upset when you didn't do well at Wii Bowling and why?
13. What made you feel good about playing Wii Bowling and why?
14. What made you feel bad when you were playing Wii Bowling?
15. Were there things you found difficult to do when playing Wii?
16. Tell me what it was like playing Wii Bowling with your team. (fun, enjoyable, stressful, irritating)
17. What do you think of playing Wii Bowling overall?
18. How have you felt on a socially and emotionally in the last month? (probe about personal feelings of loneliness or social isolation)
19. Do you think that playing Wii Bowling can have a positive effect on your social life. How or why do you think so?
20. Is there anything else you'd like to share with me?

These interviews were recorded, transcribed, and analyzed using qualitative software MaxQDA Version 11 to code statements and discover emerging themes.

Quantitative Data Analysis of Pre- and Post-Questionnaire

Data analysis was carried out using SPSS 21.0. The first step in the analysis was to check and clean the data. The outcome measures relating to friendship, loneliness, and social connectedness were analyzed by means of paired samples t-test at pre and post tournament time points.

Qualitative Analysis of Personal Interviews

The focus of this approach is to understand an issue or problem with a specific example (Creswell, 2007). Our data collection takes both a qualitative and quantitative approach (Yin, 2003) centering on the use of playing digital game, Wii Bowling, to enhance the social life of older adults. Through data collection, a detailed description can be assembled focussing on a few key issues or themes that, although can't be generalized beyond the case, advance the understanding of the case itself and explore the meaning of the issue being studied (Lincoln & Guba, 1985a).

Data analysis involved preparing and organizing text transcriptions of interviews, and collecting the codes into themes, then illustrating each theme by actual quotes made by the participants (Creswell, 2007). The specific steps taken were writing codes and memos, noting patterns and themes, counting frequency of codes, developing evidence, and making comparisons (Miles, Huberman, & Saldana, 2014).

As Saldana explains, coding is not an exact science but an act of personal interpretation based on the researcher's theoretical and conceptual framework, as well as coding method selected. In general, Saldana suggests, many of the same codes will be used repeatedly throughout the transcription, a process he calls natural and deliberate, resulting in patterns of action and meaning. As coding is an interpretative process, the choice of coding acts as a filter that first begins with one's involvement as a participant in the fieldwork itself (Saldana, 2009). Sometimes researchers develop lists of codes when they review their data while others, such as Creswell (2007), develop a short list of five or six categories with labels or codes that are expanded into categories as he continues to review the data. This process is similar to the approach we took with our coding described in the next section.

Our Coding Process

The coding process of the post tournament interview transcriptions encompassed three basic steps: familiarizing ourselves with the content of the transcriptions, applying open coding to content and lastly analyzing codes for emergent themes. Initially, two Research Assistants worked together to begin anticipating the type of codes that might

be seen in our interview transcriptions in light of our research questions. In this way, coding provided a means of access to evidence and a tool for testing our assumptions about the data (Bazeley, 2013). Preliminary coding of three post tournament interviews was completed using pencil and paper; one transcription was worked on together, then each Research Assistant coded two transcriptions separately and cross-referenced their results. This provided a sense of the type of material captured in the interviews and the provided direction to the coding process similar to the method described by Creswell in the previous section.

After the preliminary coding, we imported the interview files into qualitative data analysis software MAXQDA so that codes could be applied and recorded digitally. Structural, descriptive, and process coding were selected as effective coding methods for capturing the essence of the phenomena experienced by our participants.

Coding methods are divided into two categories: the first cycle and second cycle of coding. The first cycle includes Elemental Methods that encompasses three types of coding used for this research: structural, descriptive, and process coding (Saldana, 2009). This selection of two or more types can serve the goals of the analysis since coding methods are not discrete but overlap in applicability (Saldana, 2009). Saldana recommends structural coding when material is coded in light of the research questions used to frame the original interview. He suggests that this type of coding is considered appropriate for nearly all qualitative studies but particularly those involving multiple participants' semi-structured interviews used to gather topic lists of major categories or themes. Our research questions were concerned with the Wii Bowling experience in terms of their potential to enhance the lives of older adults. To review-- these research questions were:

1. What do older adults perceive as benefits of playing the digital game, Wii Bowling, in the tournament?
2. What do older adults perceive as barriers to playing the digital game, Wii Bowling, in the tournament?

An example of the use of this type of code is as follows: "*Yes, it had a social effect because we'd meet and –first Friday, we met in the evening and we had a bottle of wine or whatever, sherry, and we would have a little bit of a glass of sherry. And that sort*

of thing. Yes. And it did have a positive effect on the socializing." This was coded as "Better social connections", a topic related to research question 1.

Descriptive codes are used to assign labels to data using a work or phrase to summarize the basic topic of each statement that can be useful for research focused on social environments (Miles et al., 2014) similar to our study. For example, the sentence, "*I just saw the notice on the board, and I thought it would be fun. So, and I'm that type of person, I will try something new and something different, so um I just thought that's going to be fun to do, so—that why I went for it, yeah*." received the code, "Feeling modern and with the times."

Process coding was also used to label expressions in terms of gerunds that end with "ing" that imply processes that become strategically implemented over time. Usually participant's responses consisted of a short paragraph or chunk of sentences within the transcriptions (Miles et al., 2014). For example, a process code "Experiencing disabilities" could be applied to the following statement, "Well, because I had carpel tunnel surgery on this hand and then I'm numb in the hand."

If more than one completely different idea was included within that statement, each idea was coded separately. Words that were simple affirmatives or part of the introductions and other topics not related to the study were coded as "Irrelevant". Other codes were applied when the participant expounded beyond a simple yes or no.

Memos were created frequently to elucidate coding choices and to further explain the respondent's statements as well as note codes that might contain similarities and be combined in Second Level Coding. In addition we began to map out more prominent codes and possible relationships in pencil and paper diagrams.

Second Cycle Coding

The first cycle of coding provided a method for summarizing segments of the data. Pattern coding grouped these codes into smaller number of categories or themes (Miles et al., 2014) compiled into a table that shows the codes, number of times the

codes was applied, and the number of participants who had this code applied to their comments. This table is shown below.

To determine predominant themes, we first highlighted those statements where 75% of the total number of participants (n= 17), that is 13 or more people had made comments that received that specific code. Next we highlighted those statements where 50% of the total participant's comments were coded with a particular code and this was selected as the cut off for codes that would be reviewed and discussed in detail in the findings.

We also noted those instances where participants had commented on a theme multiple times during the interview process. For example, there were 10 participants whose statements were coded with the same code 50 times. NOTE: Where themes were generated according to number of people but where there was similar number of people, the number of times the code came up was used to break the tie. Lastly, statements coded with the same code by 75% or more of total participants were identified. These codes applied to statements by 75% of the participants and were highlighted in yellow. The analysis of this data is described in the next chapter.

Validating Data from Individual Experiences

Validating the data, results and their interpretation differs in quantitative and qualitative research but both serve to check on the quality of the research overall. Internal validity and external validity are important concerns to in experimental studies while external validity is the extent the results can be applied to larger populations is a significant concern for survey designs (Creswell & Creswell, 2007).

In qualitative studies investigators focus on the accuracy of the account, trustworthiness, and credibility (Creswell & Creswell, 2007) to build evidence for the code, and checking for disconfirming evidence. Another researcher was also requested to examine the coded transcriptions and file a report on the rigour and authenticity of the methods used. This report is summarized in the next chapter and has been added to Appendix B.

We also considered the participants' views on the credibility of our analysis and findings and our analysis by sharing coded transcripts with several participants from the centers who had taken part in the study. Member checks, considered to be a critical technique for establishing credibility (Lincoln & Guba, 1985a) and are part of our efforts to further substantiate the authenticity of the results of the qualitative research process.

Our goal was to triangulate data from a variety of sources such the quantitative and qualitative results but of course it is also essential to reflect on the researcher's own personal experiences and draw on personal assessment of the findings and inherent biases. This is our goal when we discuss our finding and interpretations in the following chapter.

Summary

During our research project participants were recruited and organized in teams who played in an eight-week Wii Bowling tournament. In light of our research questions we implemented a mixed methods design by deploying a pre- and post-test to collect quantitative data. We conducted in-person interviews of a small group of participants after the tournament. To measure the level of loneliness, social connectedness, and friendship the questionnaire included three scales respectively: Hawthorne's Friendship Scale, the UCLA Loneliness Scale, and the Social Connectedness Scale. The quantitative analysis was carried out using SPSS to compare results before and after participants has played for eight weeks. The interviews were recorded, transcribed, and then coded using MAXQDA V 11. To triangulate the qualitative results, peer review of methodology was requested and completed.

Chapter 4. Findings

Introduction

The goal of our research is to offer a comprehensive evaluation using these research methodologies to answer the following research questions:

1. Does playing a digital game with peers, Wii Bowling, in a tournament reduce older adults' feelings of social isolation and loneliness?
2. What do older adults perceive as benefits of playing this digital game in the tournament?
3. What do older adults perceive as barriers to playing this digital game in the tournament?

Quantitative Research Findings

A pre- and post-questionnaire was distributed to participants in order to gather data that will help answer our first research question: Does playing a digital game with peers (Wii Bowling) reduce older adults' feelings of social isolation and loneliness? The pre-test questionnaire also included questions to collect demographic information about the participants' such as gender, age, relationship status, living arrangements, accommodation, and education.

Participants

Table 4.1 below reports the demographic characteristics of the participants. Of the 73 participants in the experimental group, there were 52 female (71.2%) and 21 male (28.8%) participants. Fifty-five were widowed or single, 18 lived in common law or married relationships. The majority (69.9%) lived alone, and 30.1% (n=22) had other living arrangements. It is notable that over 71% of our group were 75 years of age or older. Seven of our participants lived in a house, 29 in an apartment and 37 lived in an independent/assisted living facility. When asked about level of education, 36 had high school or less education. Thirty-three had attended some college, or completed a 2 - 4 year degree or CEGEP while three had completed a Master's degree.

Table 4-1 Demographic characteristics of participants

Variables	N	%
Gender		
Male	21	28.8
Female	52	71.2
Age		
65-74	21	28.8
75-84	27	37.0
>=85	25	34.2
Current relationship status		
Married/Common law	18	24.7
Single/Widowed	55	75.3
Living arrangement		
Alone	51	69.9
Other	22	30.1
Living place		
House	7	9.6
Apartment/condo	29	39.7
Independent/assisted living home	37	50.7
Education		
High school, less than high school or equivalent	36	50.0
Some college - 2 or 4 year degree /CEGEP	33	45.8
Master's degree	3	4.2

Pre-test and Post-test Scores of Friendship, Loneliness, and Social Connectedness

The questionnaire designed to measure the participants' perceptions of their level of loneliness, friendship, and social connectedness was administered before and after the participants played in a Wii Bowling tournament.

The following table of paired-sample t-tests showed pre-test and post-test scores of loneliness and social connectedness among the participants.

Table 4-2 Paired sample t-tests comparing pre-test and post-test scores of loneliness and social connectedness

Variables		Pretest	Posttest			
	N	Mean (SD)	Mean (SD)	(effect size)	t value	P value
Friendship	72	3.96(0.58)	3.94(0.67)	0.03	0.28	.781
Loneliness	71	2.21(0.53)	2.05 (0.54)	0.42	3.52	0.001
Social connectedness	73	3.41(0.53)	3.53(0.49)	0.25	2.18	0.033

The Hawthorne Friendship scale showed no statistically significant difference in the scores of friendship before (M = 3.96, SD = .58) and after (M = 3.94, SD = .67) the intervention for all participants, t(71) = .28, p = .781. The result suggests that the intervention did not increase the instances of older adults' perceived friendships before and after playing in the tournament.

A paired-samples t-test was conducted to compare loneliness before and after game playing. There was a difference in the score of loneliness (M=2.21, SD=0.53) before game playing and (M=2.04, SD=0.54) after game playing; t (70) =3.52, p = 0.001. The effect size was .42 which suggests that loneliness score of older adults decreased significantly after two months of game playing.

A paired-samples t-test was conducted to compare social connectedness before and after game playing. There was a significant difference in the scores of social connectedness (M = 3.41, SD = 0.53) before and (M = 3.53, SD = 0.49) after game playing; t (72) = -2.18, p = 0.033. The effect size was .25. The result shows that the social connectedness score of older adults increased statistically significantly with a low to moderate effect size after two months of game playing.

Qualitative Research Findings

This section looks at the 17 participants' evaluation of the Wii Bowling tournament and explores two research questions:

Before describing the five themes that emerged from the data analysis, we begin with a description of the participants who were interviewed followed by details about the research study settings. Next, we discuss the themes that emerged from the analysis of the interview transcriptions.

Participants

Seventeen participants were interviewed after the tournament. Eleven had not played video games in the last 5 years; the remainder had played video games within the last five years.

- Sex: Males (3) Females (14)
- Living arrangement: (5) Assisted-living (12) Independent

The following list shows the age categories of our participants.

- Five participants were 65 to 74 years old.
- Eight participants were 75 to 84 years old.
- Four participants were 85 years old or older. One person in this group was over 90 years old.

Setting

There were five centers involved in our qualitative study. For the sake of confidentiality, they were labelled Center A to E. In all cases, players lived in the centers where they played and they may have been acquainted before the tournament. However, in one complex, Center A, there were many new residents who had recently moved into the new apartment buildings opened shortly before our study commenced. Those living in assisted living centers, Centers B and C, had less mobility and less

opportunity to join outside activities and it is fairly safe to say, were even more likely to have known or been acquainted with their team members before the tournament began. In Center D, an independent living center, there was an existing coffee club in the room where the tournament was held and some attendees were regular cafe visitors. However, players on site noted that more people started coming to the in house cafe becoming audience members or playing Wii Bowling for entertainment. Center E had a social committee before they joined the study.

Centers A and B (independent living) had Wii Bowling games at their center before we began our research but no one was using this equipment at the time we launched the study.

Themes

The following table shows the most predominant codes and how they were categorized. The codes include those applied to more than 50% of all participants' comments and the number of times each code was applied.

Table 4-3 Themes, Codes, Number of People with Code, and Number of Times Applied[1] (N=17) for Interviews with Older Wii Bowling Players

Themes	Code	No. of People Making Comments with Code	No. of Times Code Applied[2]
Social connectedness	Team experience	17	37
	Interaction with others because of playing Wii Bowling	16	84
	Better social connections	13	70
	Conversations with family and friends about playing Wii Bowling	13	49
	Total times mentioned		240
Game issues	Scores and competition	15	61
	No disadvantages to playing Wii Bowling	14	32

	Wii equipment (mentioned)	11	29
	No problem with equipment	10	18
	Help with set up	10	23
	Playing with disabilities	9	35
	Total times mentioned		198
Wii as a pastime	Playing Wii Bowling was a positive experience	16	38
	Interest in playing in the future	12	61
	Wii Bowling was fun and enjoyable	12	29
	Something to do, something different to do and pass the time	10	22
	Total times mentioned		150
Background information	Participant background information	10	45
	Other activities	9	18
	Total times mentioned		63
Tournament design and logistics	(Various comments)	12	46

[1]Only those codes are included that emerged in comments by more than 50% of participants.

[2]The same code was used before than once in most people's interview transcript analysis

In the next sections, we reflect on these codes within the context of the research questions. Quotations from interviews with the participants have been chosen to illustrate the players' perceptions of the social benefits of playing in the Wii Bowling

tournament, the barriers they experienced, and some key implementation issues they encountered while playing Wii Bowling tournament. In other words, this section reflects on the evaluation of the intervention from the participants' perspective.

Social Connectedness

Earlier research discovered that interventions involving group activities rather than one-on-one activities were more successful in helping to alleviate social isolation and loneliness (Cattan et al., 2005; Dickens et al., 2011). Furthermore, when one considers that technology can be useful in developing social contacts (Baecker et al., 2012), digital games could be a catalyst for broadening social contacts especially when these games are played with other people. Social interaction has been found to be one of the important benefits of playing digital games (Whitcomb, 1990; Gamberini et al., 2009) a sentiment that seems to be echoed in the comments made by the participants in the interviews. The player's described some the social connections they developed through playing Wii Bowling and these statements were coded as 1) team experience, 2) interactions with others because of Wii Bowling 3) conversations with their families or friends about Wii Bowling 4) better social connections. These four codes are discussed in the next section.

Team Experience

Participants found that playing with their Wii Bowling team a casual but enjoyable activity. Although relationships that grew out of the Wii Bowling tournament were not profound or deep, many commented on how nice they found the other players and that playing with them created a sense of camaraderie. However, two players, who joined a second team after their original team disbanded, expressed disappointment that their former team had broken up, especially since they had a highest score of any team in the first week of the tournament. One said the experience was unsettling while the other found that the reconfigured team was not as cohesive as her former team, although she related that her new team members supported one another and "that was good."

A few of the oldest players downplayed the competitive aspect of the tournament: they simply liked to play Wii with their team. A player in her nineties told us she liked her team and being part the tournament,

> Just being there. And the same girls, and we all knew one another, and all said "hi" as we came in. We were all set for the game.

The four women, whose team won the tournament, developed a stronger connection than most teams and they often practiced together outside of their official weekly sessions. To differentiate between the team members, pseudonyms are used in the text. Isabelle describes this connection.

> Getting to know your teammates, right. Then, you know, when you see them, you sort of –well, you feel part of them Right? So it brings the camaraderie between you, you know.

Nancy, her teammate, reported she believed she had become closer to her teammates and called the Wii Bowling session a "happy event." Margo, on this same team, also agreed that they had become quite close.

Another team established their "team identity" by sporting hot pink T-shirts they had purchased for the four of them, including the two men on their team. The café organizer laughingly called their style "very distinctive."

The following comment describes how her team members demonstrated their supportiveness of one another, in particular, their support for a player who was new to Wii Bowling but a relatively new Canadian as well.

> He was new, a bit insecure. He got help and support. It's hard coming from another country. Both he and his wife feel much more in place. I noticed that we all go out to make them feel at home. I liked that part of Wii Bowling.

In summary, a number of those interviewed found the team experience helped developed stronger bonds with their team mates but the extent of these relationships varied from center to center and person to person. The team experience was primarily described as a positive social outcome of playing in the tournament.

Interaction with others because of playing Wii Bowling

Most research studies reviewed previously were concerned with the participants' relationships or experiences with fellow players such as that outlined in the previous section. Although relationships with fellow players were important, participants also noted that the Wii Bowling tournament stimulated interaction with non-players where they lived. The expanded scope of interactions beyond the Wii tournament itself was an unanticipated finding. One player provides an example of this scenario when she comments on her conversation with an acquaintance.

> At the end of our session, the last couple of sessions, couple of other people came in that had moved. I guess they had seen the volunteer thing, but they hadn't got around to doing it. They were kicking themselves literally, because they hadn't got around to doing it, and they were keen. I think some of them had some free throws.

On occasion, other residents showed an interest in gameplay sessions and became audience members and a kind of cheering section for the team representing their center. When a participant was asked about how Wii Bowling raised their profile in their center, she explained:

> Because we had people come to watch. Because they showed interest, they thought "what are they up to now."

Older adults can be very motivated to take advantage of opportunities for intergenerational play especially with their own children and grandchildren (Khoo et al., 2009) and consider playing digital games an enjoyable ways to stay connected with younger members of the family (de Schutter & Abeele, 2010). Knowing how to play Wii resulted in our participants playing with family members. In this case, a player who had serious mobility issues described how he demonstrated his expertise with Wii Bowling when he played with his adult son in his residence.

> Oh, it's kind of fun because my—I took my son down and his wife down Bowling there. And he used to be pretty good and so, you know, I'd just lean on here and pssshhht. Boom. Boom. Getting 200 plus. So he was curving all around the place and there. So, anyhow, he got a little bit frustrated.

In other situations, some players formed new friendships with their team mates or became involved in new activities with other players. A 78 year old living at an independent living center described getting to know her neighbor better:

> Well, I got to know the lady next door. And um because she was on my team and we found out that we lived next door to each other. So we are going to share a garden spot together. Um, and now that I look at the size of the spot, we probably both needed one. But anyway, we will garden together. We're going to buy the plants together. So, yes, I met my neighbour. So that was—and I might not have spent the time with her otherwise.

At another independent living center, some Wii bowlers went out for dinner with team members:

> Which is something we might not have done, but because we--there's four of us and we brought another member who doesn't bowl, but belongs in our little group, we went out together and had a meal together. So in that respect it was fun.

In the same center, another commented that she had coffee with someone she met Bowling while others started to go to church with their team members.

> Our team all goes to church together. Well, two members have come along since we started to bowl.

One Wii Bowling team started playing darts together as a way to hone their Wii Bowling skills:

> And she- she had quite a group going and then they just faded away. So, she used to go on her own. And when I started the Wii, I said to her, "You know, I would like to come down and join up with you with the-the darts, cuz it's-it's a coordination and the concentration, which I felt would help me with the Wii. I played darts before, but I hadn't played for a long time. So, you know, it was like- and she-she helped—yeah, so we've got four of us played.

Some found that Wii Bowling opened up opportunities to get involved in the center where they lived in and expanded the repertoire of social events that might engage people who might be feeling isolated.

> Well, more people get out and do things. I won't call it an exercise because it's ever so little (laughs). But, get out and become involved in more social activities. It makes for a better complex.

The oldest interviewee at 90+, who played despite impaired vision, noted that by playing Wii Bowling, she became better acquainted with her team members and expanded her social circle:

> We all have lunch in the lunch room together anyways, but... when we go on our bus trips together; we kind of sit together now or mix. Where we just used to sit with the same couple. Now we just sit with whoever we see because we have been with them in Bowling. I often go sit with Jean now or Pearl or whoever is there. We could chat away… I think it is added that we... mix in.

These stories show that participants found they became better acquainted with team members they may have encountered in their building but did not know well before the tournament. In some cases, players joined new activities with people they met through Wii Bowling such as darts, dinner, or going to church. Wii Bowling also stimulated interest among others who lived in their center and players enjoyed the attention they received when they were asked about playing in a video game tournament. Some of participants also played Wii Bowling with their children and grandchildren which they found an enjoyable experience.

Better Social Connections

Since the Wii Bowling tournament took place in the centers where the participants lived, it is likely they knew one another before the tournament, yet as the tournament carried on they became better acquainted. The women on the winning team included four women. Again, pseudonyms are used. Margo, Jocelyn, Isabelle, and Nancy met outside of the game playing sessions for practice or even to play darts together. Jocelyn, a player from the winning team explained:

> Yes. It had a social effect because we'd meet and –first Friday, we met in the evening and came up and we had a bottle of wine, or whatever, sherry—and we would have a little bit of a glass of sherry. And that sort of thing. Yes. And it did have a-a positive effect on the socializing. But it wasn't that it became a "We've got to do it tonight" sort of thing.

> You know if something else cropped up, then it was—they were very flexible.

Those who live in assisted living centers saw each other frequently and dined together, yet as the eldest player in the tournament commented her relationships with her team members became closer. This 90 year old player with impaired vision, found she become more friendly with her team mates with whom she had been slightly acquainted with in the past.

> "Yes, and when we pass each other now, we always stop and have a chat. There's different girls than I used to and so it sort of added to my collection of girls (laughing).

As mentioned earlier, in some centers, spectators joined to watch the Wii Bowling sessions. At the center where there was an established coffee group, an organizer of the cafe described how some of the "regulars" became interested in watching the Wii games:

> I mean they come in on Tuesdays just to see, where they, you now, they used to come anyway but now they come specifically and turn the chairs around and come and watch.

Conversations with Family and Friends about Wii Bowling

Participants provided humorous accounts of conversations with acquaintances and relatives who expressed surprise and responded positively when they learned about their involvement in the Wii Bowling tournament. Some players recounted recent exchanges with their grandchildren in person or on the phone while some played Wii Bowling with them during visit with them during this time. Again, the evidence of the boundaries of social interaction with family members and friends was unanticipated. The following statements describe some of these conversations and interactions.

> (Laughing) My grandson's: "Oh no, Granny!" (Laughs). No, there reaction was pretty positive. You know? And all that's nice.

> They loved it! They were so proud of me. I played with my grandsons and I always beat them. They rooted for me! They adored it. So close

> to my family. I as playing before I moved here. I played everything: tennis, golf...

Playing digital games can be an activity that can help overcome challenges with grandchildren and children (de Schutter & Abeele, 2009). One player saw Wii Bowling as a venue to play with her daughter and her grandchild who had Down's Syndrome.

> Well, my youngest—my daughter that's got the Wii Bowling thing, she has—my granddaughter has Down's syndrome. So is going to –she said, "Oh, you will be able to play with Faith." You know. So, I said, "Yes, but I'm not just going to play with Faith. You're going to be involved, too." (Laughs). Because the more [it](?), the more you have, the better it is. Right?

Older adults have reported that playing Wii Bowling had increased their feelings of being part of modern society while reducing the technological gap between themselves and younger people (Wollersheim et al., 2010)— feelings some of our participants shared. They found their friends were amused and supportive when they learned about their participation in a Wii Bowling tournament.

> Well, a lot of my friends thought it was really funny. You know, "[Oh wait] (?) You're Bowling on"; "Yes, I am. I'm bowl—I'm doing Wii Bowling." "Oh, [wow] (?)" um, most of my friends are pretty active people. They swim or they go to the gym. They play golf. They play tennis, some of them. So, it was—it was interesting for them to think that I would do this.

A 90 year old player commented on her conversation with her family:

> They laughed at first. I was thinking why not but they started to get interested and wanted to know how I was doing. Did I still enjoy it and all this? I told them we did, 'cause we were having fun together. They thought that was good.

Wii Bowling became a subject of conversation among people players already knew and initiated interactions with friends, and family members beyond the scope of the Wii Bowling tournament. These interactions seemed related to feelings of wellbeing, amusement, and greater connection with younger people.

Game Issues

Age related issues can present difficulties to older people who wish to play digital games (Lindley et al. 2008). The design of the games and the equipment can prevent the participation of older people and so limit the potential of digital games to facilitate social connections. The following themes both illustrate these problems but also demonstrate some of the adaptations put in place by participants that enabled them to play in the tournament. For example, use of controllers can be problematic; an issue noted by Gerling et al. (2011). Participants also talk about elements of competition, control and entertainment that have been described as motivators for playing digital games (Jansz & Martens, 2006). Some players also talk about their satisfaction in reaching a certain level of achievement and technical competency, feelings mentioned by Jancz & Martens' research (2006). It is interesting that none of the participants found any disadvantages to playing Wii despite encountering some problems such as game set up which they claim they did not find that daunting.

Next we discuss the following six codes: 1) Scores and Competition 2) No disadvantages to playing Wii 3) Wii equipment 4) No problem with equipment 5) Help with Set up 6) Playing with Disabilities.

Scores and Competition

The tournament included three centers that were closely affiliated so teams living in these buildings were keenly aware that they were competing with one another and added a feeling of drama and excitement for them. For example, this player found another team's over confidence entertaining.

> He says, "Of course, our team is going to win. He was very confident. But then I found out why, because I know somebody over there and he said, " We have –we have this lady that's going in." As I say, it's before it started. "And yeah, she's Bowling 250s, 260s." I go, "Oh yeah!" (Laughs) I mean, there's –okay, so I'm Bowling 200.

When participants were asked felt about the competition and scoring associated with playing Wii Bowling, several talked about their own level of competitiveness and

their enjoyment of competition. Playing Wii gave some players a feeling of accomplishment.

> I like it (Wii) because I don't like to lose. And so when someone presents me with a challenge, I give it my best—win or lose—I don't always win, but I win sometimes and, when I do, it's very gratifying for me—for my psyche.

Another also found a little competition could be a good thing.

> Well, I thought it was a good idea because I think when you're playing a game, a little bit of competition is a good thing. It doesn't have to be "Okay, let's go out and play a round of golf and it's a hundred dollars per person " type of thing."

Her team mate reported that getting strikes could be exhilarating.

> Well, when I—when I have the strikes—ooohhhh! You know, you just jump up and—Oh! It's great! Yeah. It was—and, you know, having good scores. You know?

Of course, the other side of winning is losing. This response describes the disappointment of getting low scores.

> Some of the lousy scores I got. (Laughs). But, outside of that, no. And I didn't really feel bad. I was just upset with myself. I should—I should have done better.

For two older players, a 79 year old and 80+ year old, competition was not as important aspect of playing Wii Bowling.

> As I get older, I'm not—I realize that competition isn't the most important thing anymore. When I was younger, it was a little different. So, I'm not—I would say I'm not the most competitive person in the world, but—but I think –no, I thought it was excellent.

However, the more senior of these two players said she had the feeling of being assessed or "graded" in the tournament when the scores were displayed.

> It upset them more because they were trying to get up higher in the professional level or whatever they call it. You know they grade you at the end of the game (laughs).

Some found it frustrating when others were not as motivated as themselves do well in the tournament. This topic was mentioned by a player who was reorganized into another team when her two of her team members dropped out.

> What it did teach me is that I'm more competitive than I thought. (chuckles) And I have kind of a short fuse (laughs) when I'm playing. . But, I did find it irritating when my –when the members weren't as interested or as focussed as I was.

In general, participants found overall that competition stimulating but for some participants, playing in a group that did not share your level of involvement could be frustrating. Furthermore, some of the oldest players that the competitive aspect of playing Wii Bowling in a tournament was not a motivating factor for them.

No disadvantages to playing Wii Bowling

All 14 participants whose statements were received this code found no disadvantages to playing Wii.

Wii equipment, no problem with Wii equipment, and help with set up

These three codes are all related to perceptions of how easy it was to use the Wii Bowling interface and equipment. When asked in general if they had experienced problems with the Wii equipment, nearly all participants quickly said they had no difficulties. But when asked about specific elements of the equipment such as the controller, monitor visibility, and equipment set up, more information was divulged. This comment encapsulated the attitude of some older adults vis-a-vis technology and why some may have had challenges with it.

> They don't want to even try anything new and they're not willing to give it a chance. And some of them were having trouble working the buttons on the remote and that sort of things, so. And they didn't get—well, some of them, it's a memory thing, too—they'd forget to come and that sort of thing. But, no, I didn't have that problem (chuckles).

Seven participants said using the buttons on the controller was an issue for them. Using the controller presents a challenge since the player must release a button on the lower side when they want to “throw” the ball. This could have presented a barrier for those with poor coordination.

> For some people. People with less confidence, little coordination. I saw a couple who couldn’t use the controller: they got embarrassed and they didn’t come again.

Setting up the avatar representing each player can be awkward and challenging to select as the virtual hand the player manipulates on screen is very difficult to control.

> Getting it started; it was to begin with. You know? It was, sort of. You know? We played and I- I found—no, I wasn’t the only one, I don’t think, that trying to control the hand on that –cuz of, I guess, as we get older our nerves.

Setting up the equipment was the most challenging part of playing Wii Bowling for older players. The four oldest players mentioned that they needed help with set up and in most centers there were key players who assisted with this task.

> Yeah, there’s been—well—again about three people that could set it up and they’re not Bowling now, so uh I set it up for some people and then go back and shut it off, so they can know what to do, but they don’t know how to set it up or turn it off. So, that’s another thing. It limits it a little bit.

This key player set up the equipment before anyone else showed up for the Wii Bowling session. But even he had problems sometimes although not in a serious way. His team mate comments,

> I don’t think there are barriers. Not if you’ve got someone there that can run you through it. I mean G--’s still turns it off when he should be turning it—you know, turns the wrong one off first type of thing. Ahh! What have you done? (Laughs).

It must be noted that in one center where our oldest players joined our research, the Research Assistant assisted with set up and coaching.

Playing with disabilities

Nine participants mentioned physical challenges when playing Wii including carpel tunnel, ability to stand, or problems with balance. Some used walkers or a cane. Balance seemed to be the most significant issue.

> 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.

Another describes carpel tunnel as a physical problem that affected her ability to feel the buttons on the controller.

> I found that my numbness (in my hand)--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.

The oldest player's vision was impaired, and she initially wondered if the other players would allow her to play with the team.

> ...I don't see very well so I just have to take a chance and throw it. I thought that they wouldn't want me on their team because I didn't know. It didn't seem to make much difference too -- I balanced out with what they... So it was okay, they let me play.

The use of walking aids can called for a larger playing area when playing with others using similar aids.

> The other thing too is that there seems to be more and more people using walkers, and the area that we got to bowl in is only so wide. And you couldn't—I guess you can get at various angles, but when you're looking at the screen at an angle, it-it's awkward. I'm bowling sitting down and bowling like this. I used to stand up and put my hand on a chair, but another gal comes along and she did the same thing. So we-- meant that we had to cross over each other or move around.

Even with these obstacles, this player told us that he "used to bowl over 200 pretty regularly." The important thing, he says, is to keep moving despite your disability.

It also takes concentration to play Wii Bowling and sometimes even chatting among players can be a distraction.

> I found out that—I shouldn't say we—that, sometimes, people didn't like to talk or didn't like other people talking while they were Bowling because they had so much concentration to do. So, that's one of these things of as you get older, you just can't multitask.

Even the noise of the game can overload the senses and be too intense for older players. One team of our oldest players elected to turn off the game sound effects, for example, the crashing of pins and virtual audience hubbub on screen.

Wii as a Pastime

Digital games are a source of entertainment that could be a form of escapism that offers a respite from some of the more difficult aspects of ageing; a quality of gaming mentioned in another study by Phillips et al. (1995). The feeling of flow associated with playing games described earlier, also lends itself to the enjoyability of playing games (Takatalo et al. 2008). Phillips et al. (1995) refers to the concept of playing digital games as a pastime as a mechanism for avoiding boredom.

This next theme includes four codes: 1) playing Wii Bowling was a positive experience 2) interest in playing in the future 3) Wii Bowling is fun and enjoyable and 4) Wii Bowling is something to do, is something different to do to pass the time.

Playing Wii was a positive experience

Sixteen participants expressed statements that were coded as "playing Wii was a positive experience." Several others simply agreed when asked if playing Wii was a positive experience. No participants viewed playing Wii as a negative experience.

Interest in playing in the future

When interviewed after the tournament, twelve of the seventeen participants commented on their interest in playing Wii in the future although one felt that she's only participate if there was another tournament. Some mentioned that they would be more

likely to resume playing in the fall when there are less opportunities to socialize with friends and family. One of the most elderly players felt that she would like to play again but would need support to set up the game and "turn on the television," another reference to the difficulty in the initial set up Wii Bowling equipment. Her team mate also asked for instructions on "how to turn the screen on."

The experience of playing in a tournament appeared to stimulate interest playing in a league. This player explains why she would keep playing Wii Bowling and her interest in finding new people to play in a league in the fall if they still had access to the Wii game equipment.

> And like I was trying to—chatting with people about doing—once I found out we were going to have them [Wii equipment] for two months-more months. I'd really would like to start another little league.

Another expressed interest in having a Wii night complete with food and drinks.

> I really –we really want to get this going—well, I've suggested and um we will work at it—it's like have one night a week—a Wii Night. You know? Like Happy Hour.

The availability of the equipment was an important factor in deciding whether to play in the future. Two players suggested the possibility of playing other games, for example tennis. At one center, they continued to play on Tuesdays as they had during the tournament.

Wii Bowling is fun and enjoyable

Twelve of our 17 participants told us that Wii was fun and enjoyable although many of the responses were quite brief. One player felt inspired to try more of the games available in the Wii Sports package and found it "a lot of fun." Another player laughingly described how they were asked to "keep it down" while they were playing which they found amusing. However, another player was upset that some had dropped out of her team. So when teams broke down and were reconfigured into a new team, she found this an unwelcome development.

Something to do, something different to do and pass the time

Just over half of the participants found that playing Wii offered them something to do that was enjoyable and helped them to pass the time for a couple of hours. Again, the responses were quite brief. For example, “Gives me something to do.” Another player said, “So in that respect, it was just—yeah, like something to do.” Time was another theme some explored. As one player suggested, as you grow older you are looking for ways to spend your time. Another player prolonged sitting was painful described that playing Wii added a focus to his day that got him moving. Even when player’s mobility was not compromised, a player looked forward to playing and socializing.

Tournament Design and Logistics

In our review of the literature, only one study mentioned playing digital games in the context of a tournament. In this study, researchers organized 30 older adults between the ages of 60 and 94 into a Wii Bowling league where players were close enough to play together in person. Although their emphasis was on empowerment of a co-located space, they did find that the tournament encouraged engagement and social connections (Harley et al., 2010). In this section, codes relating to aspects of the tournament not mentioned earlier in this chapter are discussed, such as participants time commitments and recognition of tournament winners by administration and peers.

The Wii Bowling tournament took place over a period of eight-weeks and some found it challenging to sustain a team of at least three players for each weekly session. This was mentioned several times at one center in particular where there had been under quarantine due a flu outbreak shortly before the tournament started. This team included some of our most elderly players and to them the launch of the Wii Bowling tournament seemed to be a rather sudden development that involved commitments that were difficult to meet. Another younger player on the winning team enjoyed the casual nature of playing Wii Bowling and observed that playing each week was a minor commitment of time.

Competition and the exhilaration of winning also played a part in the Wii Bowling tournament. The feeling that playing Wii Bowling was fun came up in many of the

conversations with our participants in a variety of contexts. This player describes her positive experience playing Wii Bowling which culminated in her team winning the tournament.

> It was fun. It was fun. And, of course, we had anxious moments. You know what I'm saying? We did. (chuckle) Because I told them—when we started this thing: "We're going to win this [year]," I told them. "We're going to win this tournament."

Another team member described their disappointment when their achievement went unrecognized by the administration of the organization that managed three of the centers in the tournament. Nevertheless, they believed they had the "last laugh" in their intra center competition when they ended up placing first in the city-wide tournament.

> It was competitive. It was great fun, and we are so—that we've beaten teams that had two teams in. You know? I mean I think our achievement is amazing. (Laughs.)

Member Check

In order to further substantiate the credibility of our findings, four of those interviewed were asked to review the transcription of their interview with the researcher. All four indicated that they were satisfied with the coding procedure and confirmed they believed the codes captured the essential meaning of their statements.

Summary

This chapter described our quantitative and qualitative findings and offers an evaluation of the Wii Bowling tournament from both perspectives. The results of our quasi-experimental research showed that the loneliness score of the participants decreased significantly after two months of playing Wii Bowling and the level of social connectedness increased significantly during that same time period. Results also suggested that the intervention did not change the level of the participants' friendships to other team members when comparing levels before and after the tournament.

Since the majority of participants interviewed found that elements of the Wii Bowling tournament fostered social connectedness through team membership, brought about new or deeper friendships with other players, as well initiated interactions beyond the scope of the tournament itself, it appeared that this experience provided social benefits that most of these participants valued. Of course, the dynamics of games like Wii Bowling change as people play them. As such the social connections made during the tournament depend on how the game unfolds as well as the people who are playing at that time (De Schutter & Abeele, 2010).

The qualitative findings also showed evidence that playing in the Wii Bowling tournament also presented barriers to their full participation. However, even the negative aspects seemed not to detract from the overall experience of playing Wii Bowling. All participants claimed they found no difficulties in playing Wii or with using the equipment, however, there were reports of some constraints due to participant's physical abilities. Setting up equipment and getting the game started could be a major issue especially for the oldest players but the participants stated they found no disadvantages to playing Wii Bowling. These comments although somewhat contradictory provided useful information on implementation issues that could be addressed in future work.

In general, the findings relating to social connectedness appeared to provide information that answered the first research question about the social benefits of playing in the Wii Bowling tournament while their responses regarding game issues shed light on the research question about the barriers they had experienced, especially when considering the data relating to the use of the Wii Bowling equipment and playing with disabilities.

We discuss these findings in detail in the next chapter and suggest how these barriers might be addressed to create a positive social experience for older adults.

Chapter 5. Discussion & Conclusion

Previous research on digital games has been primarily focused on younger people rather than older people and when focussed on older adults often centers on cognitive and physical effects rather than psychosocial effects we have described in this thesis. The goal of our research is to investigate the potential of the digital game, Wii Bowling, to enhance the social lives of older adults. We measured the level of perceived loneliness and social connectedness before and after an eight-week Wii Bowling tournament and by collecting data through a qualitative study asking some participants about the social nature of their tournament experience.

To position our research within social a gerontological framework, we have discussed theories of ageing advanced by Havigshurst, Cummings, Atchley, Rowe & Kahn, and Cain to better understand the social world of older adults. While Cummings (1961) viewed disengagement as an expected outcome of ageing, Havigshurst (1961) , Lemon and Bengston (1972), and Rowe and Kahn (1987) advocated activity as a way to maintain the quality of life as one ages. Rowe and Kahn described an active engagement with life as an essential ingredient of ageing successfully. The World Health Organization report (2008) described social relationships as a contributing factor to healthy life expectancy and quality of life. House et al. (1988) also found a link between social relationships and mortality (House et al., 1988; Cohen et al., 2000). It is now believed that relationships are critical for overall wellbeing and being a member of a social network can create feelings of self-esteem and a sense of purpose in life (Cohen et al., 2004). Therefore, as older adults face significant change and personal loss later in life, actively engaging, developing, and sustaining one's personal social network can provide both valuable resources and support that help mitigate these difficult challenges (Gray, 2009; Theurer & Wister, 2009).

We also reflected the changing demographics in our society which showed the number of older people is steadily increasing; a trend magnified by the ageing of the baby boom generation. Although ties between younger and older family members and

friends continue to be strong there are some older adults who are at risk for loneliness, depression, and social isolation although the exact numbers vary according from study to study and country to country. Nevertheless, the factors for loneliness are numerous and complex as shown in Chapter 2 in Table 2.2 created by Jylha (2010). While there is evidence that shows that many older people have deep and frequent contact with family (Taylor, Morin, Parker, Cohn, & Wang, 2009; Victor et al., 2009), and that non-kin relationships are becoming more prevalent within the social circles of older people (Beck, 2000; Phillipson, 2013), there are elderly people who are at a risk of loneliness and social isolation.

Expanding social networks and social activities can alleviate loneliness and ease social isolation (Cattan et al., 2005) and technology can play a role in enhancing the social connections of older people (Baecker et al., 2012). When played with others, digital games have shown to promote social interaction and are inherently motivating and enjoyable due to a number of factors including flow and feelings of immersiveness (Marston,2013;Takatalo et al, 2007). Digital games also allow for competition and control, provide entertainment, and can serve as an outlet for escapism (Jansz & Martens, 2006), qualities that attract people of all ages.

Our data painted a picture of the social side of the gaming from the point of view of a segment of the population which did not play digital games in their youth and up to recently has not been considered to be part of the gaming landscape. The number of older people playing digital games is growing (Lenhart et al, 2015; Pearce, 2008; Marston, 2014), yet some of the barriers older people encounter may prevent them from fully taking advantage of the social benefits they offer (Whitlock et al, 2011; Marston, 2013) due to age related changes such as issues with vision and hearing, and balance and coordination (Czaja & Lee, 2008) that mean the oldest of the old may face more serious constraints to playing digital games (Gerling & Masuch, 2011) than their younger counterparts. Nevertheless, when potential benefits are presented to them, these can outweigh negative aspects of game design that can limit full participation for some older people (McLaughlin et al, 2012).

This research launched a comprehensive evaluation of a Wii Bowling tournament to learn more about the social benefits and barriers of playing Wii and reported the quantitative and qualitative data we gathered. Now we will create an integrated picture of how the results related to earlier research, what has been learned, and what is still open for future research.

Major Findings of the Study

Our quantitative study included 73 participants of which 71.2% were female and 28.8% were male; the majority (75.3%) of which were single or widowed. For the purposes of our study, participants were defined as those 60 years of age or more although ultimately, all 73 who joined the study were 65 years old and over. Indeed, eighty percent of the participants were 70 years old.

Some of our participants had age related health issues although when observed by the Research Assistants none appeared to be suffering from dementia or had been diagnosed with dementia as far as we know. Although old age has been defined in chronological and biological terms, or as a particular stage in life, or as being a member of a cohort born in a specific period of history (such as the baby boom), it is clear that older people are not a homogenous group and the category of old age is formed within the societal and historical context of the time. We would like to make it clear that conceptualizing ageing adults as those with particular tastes and preferences or with similar problems should not be interpreted as singling out older people as a group who have particular needs that can be addressed by using digital games (Iversen, 2014) but as a social activity that has the potential for enhancing the lives of older people and a subject that has not been well studied in the past.

The next section discusses our findings within the context of our research questions.

Does Playing a Digital Game (Wii Bowling) with Peers in a Tournament Reduce Social Isolation and Loneliness?

Data showed that participants' levels of loneliness decreased while their levels of social connectedness increased when comparing levels before they started playing to when they finished the tournament.

However, our results did not show an increase in the level of friendship experienced by the participants when measured before and after the tournament. This difference could be due to the nature of social connectedness as opposed to friendship. Social connectedness refers to more casual relationships that involve an individual's sense of belonging and being able to relate to others (Van Bel et al., 2009) while friendships are considered to involve much deeper interpersonal relationships (Allan, 2010). The limited scope of the Hawthorne Friendship Scale may be another factor as this scale included only six items as while the UCLA Loneliness Scale included 20 items and the Overall Social Connectedness Subscale included 12 items in our questionnaire.

What do Older Adults Perceive as the Benefits of Playing the Digital Game, Wii Bowling, in a Tournament?

To collect additional information about the Wii Bowling tournament, we also launched a qualitative study that included 17 participants recruited from those who participated in the quantitative study. This data allowed for triangulation and identified, as others have previously, that those who played Wii Bowling found it a positive experience and an opportunity for social interaction (Kahlbaugh et al., 2011; Marston, 2013; Wollersheim et al., 2010).

Our study also provided insights about the team experience as the design of the study created a venue for participants to work together as a group of three or four while competing against other teams in the greater urban area, which possibly enhanced the social experience by integrating both competition and collaboration on a wider scale than would have been possible in one location. The winning team became very close during the tournament, although it wasn't clear whether their success fostered closer relationships or vice versa. During the tournament, these four players met regularly, and

socialized with one other outside of the tournament schedule. They seemed to form a strongest connection of all the players interviewed from the five teams.

Although all those interviewed commented on the positive nature of their team experiences, the two teams that lost participants and were reorganized found this regrouping process disorienting and discouraging, especially since the original team had achieved a very high score in the first week of the tournament. This suggests that playing with a regular group may have certain benefits.

Some expressed the opinion that making a long-range commitment over the course of the eight weeks of the tournament was difficult for them to make, and this was more frequently mentioned by the eldest players. We had attempted to mitigate this by only counting the scores of three players rather than all four to permit some absenteeism yet some of the older players found the length of the study posed a challenge for them. While the eldest players were not particularly interested in the competitive aspect of the tournament, they enjoyed playing Wii Bowling with their teammates. For younger players, competing with one another and the other teams appeared to be an enjoyable part of the game experience.

Audience participation was encouraged, and this brought about positive social contacts with those who joined as spectators. Some participants commented that playing Wii Bowling stimulated conversations from peers who were interested in what they were doing in the study. Our study seems to indicate that playing Wii Bowling was an enjoyable way for older adults to interact, extend their social networks, and deepen bonds with those they already knew casually or were acquainted with where they lived. Playing Wii Bowling also led to interactions outside the game environment and expanded social connections for participants beyond the weekly Wii Bowling sessions. These interactions included conversations with fellow players after game sessions, participating in outside activities such as going to dinner, or going to church together, as well as playing other games with people they met in the tournament.

Our qualitative data also found that playing Wii brought about intergenerational play among friends and relatives which was an unexpected finding as the focus of our study was on the social impact of playing with peers. Other studies have also found that

games could promote intergeneration interaction. Two of these studies focussed on unique games rather than an easily available commercial game like Wii Bowling and include Eldergames by Gaberini et al. (2009) oriented to the study of cognitive training and secondly to social interaction, and Age Invaders created by Khoo et al. (2009) to investigate intergenerational play among players. Voida et al.'s (2012) study also focussed on the impact of intergenerational play as well as social isolation using qualitative methods. Their findings highlighted the extent to which existing gaming technologies supported interactions within collocated intergenerational groups rather than distributed tournament players (Voida & Greenberg, 2009). They too found that console games offered a social bridge between generations, although only one of their 12 groups of participants included members over sixty years of age.

In our study we found that our older group of players independently selected to play Wii Bowling with younger family members including their grown children and grandchildren or had conversations with them about their experience in the tournament. Our participants noted that playing with adult children or grandchildren added a welcome dynamic to family relationships which substantiates earlier findings that intergenerational interaction is a motivator for playing digital games (Khoo et al., 2005; Harley et al., 2010) and offers the opportunity to extend the diversity of people in one's personal network, a factor that has been identified as strengthening social interconnectedness in one's social network (Voida & Greenberg, 2012). It appears that playing in the Wii Bowling tournament facilitated interactions that were very important to participants. The following figure and table illustrate the model of social relationships and connections that emerged from the Wii Bowling tournament.

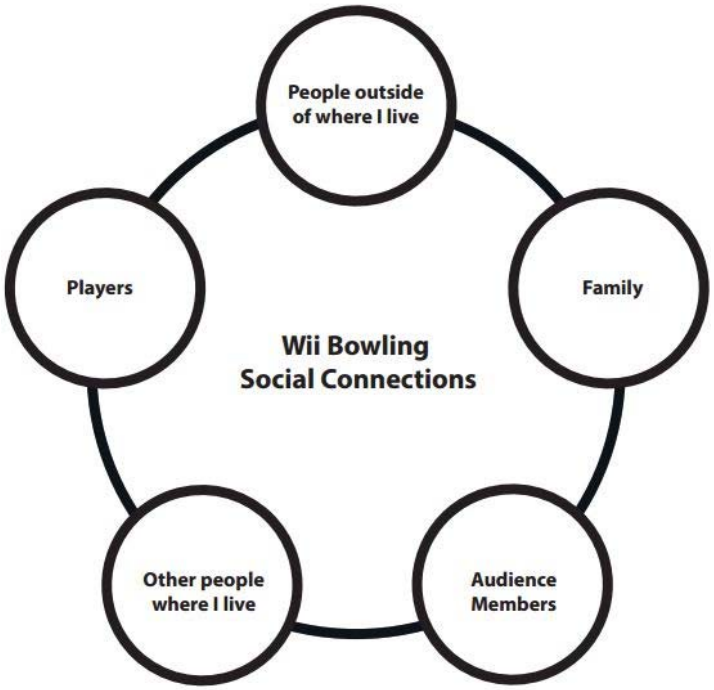

Figure 5-1 Social Connections Made Through Playing Wii Bowling

The table below shows social connections that emerged during the Wii Bowling tournament and an example of a quote that illustrates this connection.

Table 5-1 Social Connections and Interview Quotes that Illustrate Connection

Social Connections to:	Sample Interview Quote:
People outside of where I live	Well, a lot of my friends thought it was really funny. You know, "[Oh wait] (?) You're Bowling on"; "Yes, I am. I bowl—I'm doing Wii Bowling." "Oh, [wow] (?)" um, most of my friends are pretty active people. They swim or they go to the gym. They play golf. They play tennis, some of them. So, it was—it was interesting for them to think that I would do this.
Family	Oh, it's kind of fun because my—I took my son down and his wife down Bowling there. And he used to be pretty good and so, you know, I'd just lean on here and pssshhht. Boom. Boom. Getting 200 plus. So he was curving all around the place and there. So, anyhow, he got a little bit frustrated.
Audience members	Because we had people come to watch. Because they showed interest, they thought "what are they up to now."
Other people where I live	Which is something we might not have done, but because we--there's four of us and we brought another member who doesn't bowl, but belongs in our little group, we went out together and had a meal together. So in that respect it was fun.

Other players	Getting to know your teammates, right. Then, you know, when you see them, you sort of –well, you feel part of them Right? So it brings the camaraderie between you, you know.

Non-family members such as neighbours and friends who become part of the social network of older adults also provide a source of social support especially when relatives are not readily available (McPherson, 2004) so from this point of view, playing digital games with peers could provide social benefits that can be important to older adults as families become more distributed. As Voida and Greenberg (2009) described, the digital game space is a computational meeting place. In the tournament context, playing digital games acts not only as a place to gather and play, but also an activity that fosters connections beyond the game and to brought more people into the orbit of this social event through conversations, or as spectators, regardless of whether they actually played or were physically present.

The tournament itself may have also played a role in highlighting the sense of sociality and drama among our participants encouraging greater interaction and engagement. The teams were aware of others they competed with especially when those participants lived in facilities that were operated by the same social agency in nearby communities. However, these teams did not meet face-to-face to play and did not communicate with one another. They did see the scores posted each week. Harley et al.'s study (2010) was the only one we encountered that also ran a tournament although they met in person to play. They also saw a team building effect but their study's main focus was on qualitative assessment of the co-constructed and contested nature of Wii gameplay and the importance of older people gaining control over the space as part of their appropriation of the Wii. These researchers were interested in the participants' "active performance within and the surrounding gameplay that constructs it as a "meaningful and beneficial engagement" (pg 172). Their recommendations for enhancing and empowering older Wii players are discussed later in this chapter.

We are not claiming that playing Wii Bowling provided more social opportunities than other recreational activities, however, our results suggest that playing Wii Bowling may not have only fostered positive social interactions at the time and place where

games occurred, but also extended relationships beyond the scope of the game, even in facilities where people already knew their fellow players and audience members.

What do Older Adults Perceive as Barriers to Playing the Digital Game, Wii Bowling, in a Tournament?

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 in relation to their 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. It's interesting that some of the participants' statements appeared to be contradictory, for example, when they related stories about the barriers they encountered, yet claimed these barriers were not enough to diminish their ability to take part and have a positive game experience.

This apparent contradiction may be explained by McLaughlin et al's (2012) theory that outlined a cost/benefit perspective whereby older adults playing games assess the potential advantages of playing and disadvantages posed by the constraints they experience when playing, and conclude that the benefits outweigh the challenges of poor game design. Within this context, our players may have found that the enjoyable social nature of playing Wii Bowling outweighed the difficulties of using the controller or seeing the screen clearly or achieving lower scores than others in the tournament. Research has shown that the social benefits of playing games are a strong motivation for older people to play them (McLaughlin et al, 2012; IJsselsteijn et al, 2007).

Setting up of equipment was of special concern and was mentioned by several teams in the qualitative study and often taken care of by a key person who was proficient with the technology or enjoyed using technology. In four of our five centers, there was a player or a resident who took responsibility for setup. All were males even though the majority of players in our study were female. This situation could imply that further guidance and social support could allay fears about technology, and build a sense of self efficacy that helps overcome constraints experienced by those with limited physical

mobility (Allender et al, 2006). Guidance could include more instruction and practice on how to play the games, how to set up the equipment, and provisions of incentives that encourage older people to use technology and increase the value of technology in their lives (Marston, 2012). Incentives such as the tournament and small prizes such as we organized could be examples of how to encourage older people to learn to play digital games. As Sauvé et al (2015) noted in their study, games that increase usability for older adults, are also more likely to enhance participation and enjoyment for that age group and as Marston (2013) remarked, by including older adults in the design process, games may be better developed to suit their preferences and physical abilities.

Gerling's (2011) recommendations that if Wii remotes did not have any small buttons and its pointing feature was less dependent on steady hands their usability would be enhanced. In the future, perhaps eliminating the remote and using game systems that do not use remotes might better address the needs of older adults and reduce physical barriers (Hwang et al, 2011). Hwang et al's study also raised usability factors, such as using Wii remotes from a playing position from a chair, as a number of players did in our study, which further emphasizes the idea that eliminating remotes could reduce potential barriers limiting greater participation and enjoyment. One way to do this would be to use the motion sensor system called the Kinect which does not use a remote controller.

Contributions to the Literature

Our study adds to the literature we reviewed in Chapter 2 in several ways including study participants, goals, methods, and results. For example, this research included older participants, the majority of whom were between 75 years of age and above which was not common in the literature we reviewed. Our research questions were focussed on changes in perceived levels of friendship, loneliness, and social connectedness over time rather than a comparison of digital games with another type of media. We also placed our study within the context of social gerontological literature and undertook both quantitative and qualitative methods to explore our research questions. The following studies show some similarities but also differ from our study highlighting

some of the original aspects of our work and how it advanced the study of the social impact of digital games among older people.

Allaire et al.'s (2013) study stands out from other game studies as one with a large number of participants (n=140) and has some parallels with our study in age range with an average age of 77.47 years (SD = 7.31) and its focus on psychosocial factors. However, these researchers were concerned with wellbeing, positive affect, negative affect, and depression rather than loneliness and social connectedness specifically as in our study. Allaire's study compared the experiences of those who played digital games versus those who did not while our study focussed on the change in psychosocial factors of playing a single digital game over time. However, Allaire et al. also found that those who played digital games had some positive social psychological results such as a better quality of life and lower negative affect than those who did not play digital games, factors noted by Rowe and Kahn's (1998) as indicators of successful ageing. Both Allaire's and our study, while looking at different criteria, were more concerned with social impact of digital gaming for older adults than the cognitive benefits which has been a more common topic of research.

In a systematic review of health benefits including both physical and mental health indicators of digital game playing for older adults, Hall et al. (2012) also found that the social aspect of gaming for older adults has been relatively unexplored. They also cited a lack of empirically sound studies with few studies incorporating pre- and post-tests such as those implemented in our study.

Marston et al.'s (2013) systematic review concentrated on the role of the Wii games in care facilities in maintaining physical fitness, promoting mental wellbeing, encouraging social interaction, and physical and mental rehabilitation. Their main focus was on wellbeing and social interaction of those playing Wii in residential settings but did not look at loneliness specifically or explore the diversity of settings described in our study which also included those who lived in independent residences and recreational centers. These researchers indentified that only one of six studies included in their review referred to psychological benefits such as reduced loneliness. This recent review shows that there is more scope for work in the area of social benefits and those with

larger numbers of participants would be useful since only three of the six studies in the review had more than ten participants.

Two studies reviewed earlier investigated the social effects of playing digital games as opposed to engaging in other types of recreational activities. Jung et al.'s (2007) research included 45 participants living in a long-term care facility in a longitudinal study concerned with the differences in psychological and physical wellbeing among those who played digital games as compared to those who played traditional games. Their conclusion was similar to our study: playing Wii games can have a positive effect on quality of life and diminish negative affect. They did not carry out a qualitative study.

A 10-week study by Kahlbaugh et al. of 35 people with mean age of 80 compared the levels of loneliness as well as physical activity and mood between those who played Wii and those who watched TV. They found that the levels of loneliness declined among those who played Wii but not among those who watched TV. Our findings corroborate theirs in that we also saw decline in levels of loneliness over a similar period. As mentioned earlier our work provides additional information from the participants themselves in a qualitative study that showed that many of those interviewed believed that they experienced new social opportunities as a result of their involvement in the Wii Bowling tournament both in the own game location and beyond the boundaries of the tournament.

Enhancing Digital Play Opportunities for Older Adults

There are a number of recommendations that stand out in the literature regarding the characteristics of interventions that have implications for digital gaming among older adults in terms of alleviating loneliness and enhancing social connectedness. Some of these recommendations were considered in our study while others could be implemented in future research.

In a systematic review of the literature Allender et al. (2006) referred to barriers that may prevent older adults from participating in physical activity despite the

psychosocial benefits that could be realized. They saw a complex interaction of physical, psychological, and environmental factors affecting participation in physical activity among older people. In particular, older adults identified playing with grandchildren as a motivator for increasing their level of activity. We also found our participants welcomed opportunities to play Wii Bowling with their grandchildren and considered their relationships with them to be very important. As such intergenerational play would be worth investigating further and a topic discussed later in this chapter.

Older adults have cited the lack of realistic role models in the community as a deterrent to physical activity as well as unclear guidance for taking part in these activities. For example, in Abeele et al.'s study (2010), some older adults wondered if playing digital games is inappropriate for their age group. It is possible that the fact that more older adults are playing digital games currently may not be common knowledge among older people themselves especially those who do not use the Internet. Publicising this information among older people may help reduce these misconceptions. Some of our participants mentioned that their acquaintances were reluctant to join the Wii Bowling tournament and this stereotype may have been a reason for their decision not to participate. Although none of our participants complained about the lack of clear guidance per se, they did comment on the difficulty of setting up the equipment. In our study, support from in-house staff could have helped to enable older participants to play Wii Bowling more often.

Allender et al.'s review also cited a correlation between building of skills and confidence and greater participation among those with disabilities. More time spent on skill building may also improve the game playing experience for older adults with disabilities. Also, Allender et al. mentioned links between enjoyment and strong social networks with greater participation. These linked motivators could support a cycle of more activity, creating wider social networks, increasing the level of enjoyment of playing games which could decrease the level of loneliness among older adults. In this way our research supports Allender et al.'s findings and corroborates Cattan et al.'s discovery that the most successful interventions for alleviating loneliness included group methods and participatory activities (Cattan et al., 2005).

In their paper about the use of interactive videogames to support independence of the elderly, Marston et al. discussed some of the social requirements of game design for those living with a disability. They also suggested that a lack of information about technologies, inadequate training and support, feelings that playing games is age inappropriate, and lack of suitable infrastructure can present barriers to older adults' playing videogames. They recommended the following strategies for supporting the use Nintendo Wii in a community setting (Higgins, Horton, & Hodgkinson, 2010).

Table 5-2 Strategies for Supporting Nintendo Wii in a Community Setting (Higgins et al., 2010)

Client Confidence	Client Safety
Use of one-to-one skill sessions prior to participation within a group	Client assessment for physical capacity to participate in Wii activities: for example many Wii games can be played in a seated position
Creating a Mii character provides an opportunity for a client to create a virtual self	Ensure the clients wear the Wii wrist strap, as this prevents accidentally dropping or throwing remote
Intergenerational activities stimulate learning with new technology and promote community connections	Adapt the environment as appropriate to the client's abilities
Encourage client peer support and skill learning	Avoid client fatigue by providing frequent rest breaks, particularly when first introduced to the game.
	Clear the playing area of potential obstacles

Some of these suggestions were followed in our study. Our participants were provided with training by the Research Assistants and encouraged and supported in creating their Miis while in-house client peer support and skill learning developed spontaneously among the participants. However, as far as we know there was no support during the times when the Research Assistants were not on site. Voida (2012) recommended peer-to-peer mentoring which some of our participants experienced in the course of playing with other team members. We did see intergenerational interaction develop but this was an unanticipated result and a topic we would like to explore further. Client safety was taken into account, for example, we emphasized the use of the wrist strap, but overall, our participants were self-selected and chose their own adaptations to the environment.

To encourage greater participation in digital game playing McLaughlin et al. (2012) suggested integrating a reward system to encourage participation. Again, perhaps our small prizes offered to first, second, and third place winners in our tournament offered incentives to our participants that encouraged them to play Wii Bowling which in turn, stimulated an interest in their activities from peers and family members.

Digital Games, Learning, and the Wii Bowling Tournament

The underlying fundamentals of Constructivism include the concepts of situated cognition and social collaboration, that is, the learning is situated in the environment in which it takes place (Savery & Duffy, 1998) and collaborating with others can stimulate learning and help build a community of practice (Wenger, 1998). Based on this theoretical framework, learning theory supports the premise that games, when played with others, have the potential to provide an environment for learning. Problem solving is activity that provides learning opportunities (Boud & Feletti, 1998) and there are many examples of games that facilitate problem solving as a mechanism for game play with others including Wii Bowling. A physical game like Wii bowling poses problems that involve movement, timing, and action (Whitton, 2014) so there is the possibility that playing Wii Bowling developed skills in these areas.

In our research on the social impact of playing Wii Bowling, we saw evidence that the players appreciated the benefits of collaborative play. They claimed they enjoyed the support of their fellow team members and the motivating impact this support had on them during the tournament. They also acquired the technical ability to play this game with their peers. In a sense, they formed a community of practice in which players learned the game and improved their ability to play. Through their participation, these players shared an activity and common interest that provided the environment for social learning and deeper understanding of other players (Wenger, 1998) that we saw reflected in interviews with our participants. Squire (2011) refers to video games as shared spaces where people develop expertise, social experiences, and make social connections. This assessment seems to be in line with the experiences of the older adults who played in our Wii Bowling tournament.

Future Work

Further replication of the study with other groups would extend the generalizability of our conclusions in other settings, for example, in the future we would collect more specific information about the type of setting whether independent or assisted living rather than one category for both in our questionnaire. It would also be useful to collect specific information about the age of the participants rather than using age range categories although this data is easier to collect than directly asking participants how old they are.

The coding process of seventeen transcripts was very labour intensive and involved many personal decisions but we may have taken more time and a different approach if we did this again, for example, using a more emergent approach rather than one more directly related to answering the research questions. The placing of content into discrete and useful themes did not prove to be easy goal to achieve although indicating the frequency of each type of comment did help pull out the more prominent topics as perceived by our participants.

We are interested in continuing work that could reveal information on the psychosocial impact of playing Wii Bowling for the oldest of our participants as compared to the younger participants. For example, did the oldest players experience a greater decrease in loneliness and a greater increase in social connectivity than their younger counterparts? In other words, could the most elderly benefit more from this type of intervention.

We'd also like to investigate the potential of intergenerational gameplay as a method for improving attitudes and changing stereotypes among the young and older adults. Voida et al. (2013) has suggested that there could be social benefits to expanding the number of team members who play at one time as well as including a range of players from different age groups. Adding to age diversity could offer opportunities for older players to learn technological skills from younger players, or to

mentor younger players in socially mature roles. These opportunities could be mutually beneficial for both young and old as multiple interactions involving an increased diversity of contacts have been shown to produce increased social benefits (Litwin & Shiovitz-Ezra, 2011)

Strengthening ties with family and grandchildren could be even more important today than in the past because of changing family structures which have been altered and influenced by divorce, single parenting, childlessness, being single, same sex partnerships, and common law partnerships (Wichmann, 2015). Over the last century, family composition of society has changed dramatically (U.S. Census Bureau, 2010), a trend illustrated in the following figure adapted from the Family Relationships in an Aging Society (Gillen, Mills, & Jump, November, 2012)

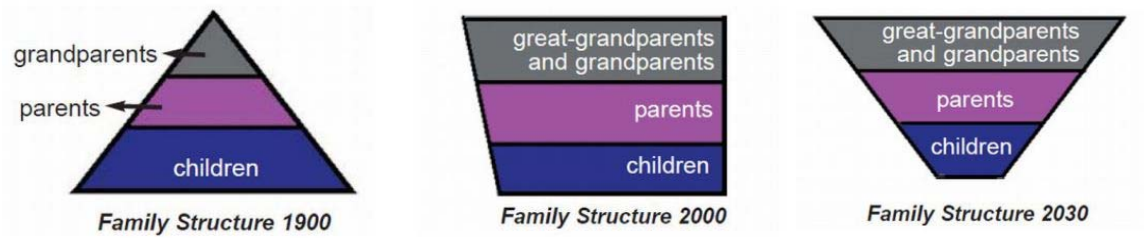

Figure 5-2. Change in Family Structure in an Aging Society

Although there are fewer members within each generation, generations are more likely to overlap providing more opportunities for continuity in these relationships and the potential of support for older people when needed (Marshall, Matthews, & Rosenthal, 1993). Within this context, playing digital games and increasing interaction between older and younger generations could provide social benefits for both groups.

To determine whether the tournament has had long-lasting impact, we have conducted a qualitative follow-up study of participants three months after the completion of the tournament to determine whether participants were still playing Wii Bowling or other games on the Wii and whether this activity was occurring in social settings such as clubs or organized groups. We are also currently following up to determine whether the Wii equipment is still being used either by participants or by others in the centres. The data from these follow-up studies are being analyzed presently.

Limitations of the Study

The limitations of this study are primarily connected to the inherent limitations of the research methodologies implemented in our study. Our qualitative research does not allow for generalization of the results and limits the claims we can make. In this case, the claims we have made are valid for the specific group of people we worked with. As discussed in Chapter 3, despite these limitations we found using quantitative and qualitative methods a productive and appropriate approach for our study. However, our study would have benefitted by the completion of pre- and post-test questionnaires by an equivalent control group that did not participate in the Wiii Bowling tournament and would have provided data that would identify baselines between those who played Wii Bowling and those who did not.

It is likely that operationalizing the study over a longer period of time would have allowed us to collect data that may have determined if the psychosocial impact of playing Wii Bowling persisted once the tournament was over. The reliability of instruments could also be challenged although the ones we used had been validated in other studies. In particular, the UCLA Loneliness Scale has been used frequently and is a well known tool in assessing the level of loneliness. The Overall Social Connectedness Subscales which collected information about social relationships and social contacts within personal social networks has not been used as extensively; however, it is one that was developed by those who worked in the field of social impact of digital games and so might offer value in the context of our study on social effects of digital gaming among older adults.

Finally, the tournament was a confounding variable as the positive results may have been partially due to the excitement of playing in a tournament.

Conclusions

There is a percentage of older people who are often lonely (Jylha, 2010; Victor et al, 2005) and those who are at the greatest risk of loneliness include widows and widowers, and the oldest of the old, those living in institutions, and those with problems

with hearing and vision. Older adults who are single or widowed made up 75.3 of our quantitative study and all participants in the qualitative study. Eight of 17 of those in the qualitative study were 75 to 84 years old and it is likely players in these age groups were experiencing some level of hearing and vision loss especially those who were over 80 years old.

Our quantitative study showed a decrease in the levels of loneliness and increase in the level of social connectedness over the length of the tournament and participant's comments indicated they found playing in the tournament with others whom they may have known or been acquainted with before had social benefits for them. Through playing Wii Bowling it appeared this experience expanded their social network, and although these contacts involved fairly casual relationships, they were thought to be enjoyable and satisfactory encounters. The results of this inquiry have contributed to a deeper understanding of the role that digital games could play in helping older adults who are dealing with feeling of loneliness and a diminished sense of social connectedness.

We hope this study has contributed to empirical research that creates a deeper understanding of the psychosocial impact of playing Wii Bowling among older adults and how the digital games experience could be enhanced for them. By reducing both physical barriers to playing Wii Bowling as well as reducing other barriers such as lack of confidence and lack of role models it may be possible to integrate game technology into to the everyday life of an older person in a way that could enhance the quality of life as they age. This study added to the field by providing data that showed evidence of a decrease in the level of loneliness and an increase in social connectedness as a result of playing the digital game Wii Bowling in a tournament setting.

Our quantitative study included a larger sample than some earlier studies and included an older demographic group not studied to the same extent as younger age groups. This larger sample size combined with the rich description of personal experience uncovered insights into the social process related to digital game playing that reaches beyond prior work that was primarily focused on cognitive and physical advantages. Our study also suggested that playing Wii Bowling might extend

relationships beyond the confines of the game playing activity itself to those who watch the game, play the game with them, or simply enjoyed the conversations they had with others about Wii Bowling.

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Appendix A. Wii Bowling Project Questionnaire

Wii-Bowling Project Questionnaire

SFU SIMON FRASER UNIVERSITY

Participant # _____ Name: _____

Team_____ Centre _____

Section 1

1. Gender

   ☐ Male ☐ Female ☐ Transgender

2. How old are you?

   ☐65-69 ☐ 70-74 ☐75-79 ☐ 80-84 ☐ 85-89 ☐ 90+

3. Your current relationship status:

   ☐ Married / Common law ☐ Single / Widowed

4. Who do you live with? (Check all that apply)

   ☐ Alone ☐ Spouse /Common law ☐ Family ☐ Room or house mate

   ☐ Other (specify _____)

5. Where do you live?

   ☐House ☐ Apartment / Condo ☐ Independent/Assisted living home ☐ Other

6. What is the highest level of education you have completed?

   ☐ Less than high school

   ☐ High school or equivalent (such as GED)

   ☐ Some college/CEGEP

   ☐ 2-Year degree (associate, diploma)

   ☐ 4-Year degree (BA, BS)

   ☐ Master's Degree

   ☐ Doctoral Degree (e.g., PhD, EdD, MD, JD)

Section 2

7. Have you played any video games in the past 5 years?

   ☐Yes ☐No

   If yes, name the game(s) you played _____

   If no, go to Section 3.

8. If you play video game(s), who do you play with?
   - ☐ On my own
   - ☐ Family members (spouse, partner, children, relatives…)
   - ☐ Friends
   - ☐ Members of a club or association
   - ☐ Others (specify_____)
9. How do you rate your level as a player?
   - ☐ Beginner
   - ☐ Intermediate
   - ☐ Expert
10. Do you participate in a weekly organized social group activity, for example, a bridge club or a book club or sports or arts organization during the last two months? (Do NOT include the Wii bowling tournament.)
    - ☐ Yes
    - ☐ No

Section 3

Select the option that best describes your opinion about each statement below.

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
1. Playing video games is a good way to spend more time with friends.					
2. Playing video games is a waste of time.					
3. Playing video games is a good way to make new friends.					
4. Playing video games interferes with friendships.					
5. Playing video games is a good way to improve existing friendships.					
6. Playing video games interferes with my personal life.					
7. Playing video games is a good way to spend more time with friends.					
8. Playing video games interferes with other leisure activities.					

Section 4

Select the option that best describes your opinion about each statement below.

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
1. I find it easy to relate to others.					
2. I feel isolated from people.					
3. I have someone to share my feelings with.					
4. When I'm with other people, I feel separate from them.					
5. I find it easy to get in touch with others when I need to.					
6. I feel alone and friendless.					

Section 5

Select the option that best describes your opinion about each statement below.

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
1. I feel that I am "in tune" with the people around me.					
2. I feel that I lack companionship.					
3. I feel that I have a lot in common with the people around me.					
4. I feel alone.					
5. I feel outgoing and friendly.					
6. I feel that there is no one I can turn to.					
7. I feel part of a group of friends.					
8. I feel that I am no longer close to anyone.					
9. I feel close to people.					
10. I feel that my interests and ideas are not shared by those around me.					

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
11. I feel I can find companionship when I want it.					
12. I feel that my relationships with others are not meaningful.					
13. I feel there are people I can talk to.					
14. I feel shy.					
15. I feel that there are people who really understand me.					
16. I feel that no one really knows me.					
17. I feel connected to others.					
18. I feel that people are around me but not with me.					
19. I feel there are people I can turn to.					
20. I feel left out.					

Wii-Bowling Project Questionnaire

Section 6

Select the option that best describes your opinion about each statement below.

	Strongly disagree	Disagree	Unsure	Agree	Strongly agree
1. I would like to have a larger circle of friends.					
2. I feel a lack of company.					
3. I would like to have a close relationship with more people.					
4. I feel a lack of contact with people in my social network.					
5. I am satisfied with the number of people with whom I have social contact.					
6. I am satisfied with the amount of contact I have with the people in my social network.					
7. My relationships with people in my social network feel superficial.					
8. I derive little satisfaction from my social contacts.					
9. I feel that people in my social network often think of me.					
10. I often think of people in my social network.					
11. I don't feel I have a lot in common with people in my social network.					
12. I feel that people in my social network do not share my interests and ideas.					

Appendix B. Coding Report

Report on qualitative coding procedure by Dr Fan Zhang June 9 2015

Note: This report is based on a checklist for researchers to improve the trustworthiness of qualitative data analysis.

The purpose of this research is to examine the social impacts of playing Wii Bowling on older adults, and potential benefits and barriers to playing this game. Participants were 65 years of age or older and participated in an 8-week Wii Bowling tournament. So, they have the best knowledge of the research topic. The researcher used a combination of different methods to collect the qualitative data such as interviews before and after the game intervention and observations. The collected data are suitable to address the target research questions. Although there is some overlap among the 20 interview questions, the questions are clear and understandable. In addition, the interview questions were framed based on the research questions, and cover all of the important concepts of this research (i.e., social aspect of the game, benefits and barriers), which makes sense of the studied phenomenon.

The coding process of the post interview transcriptions encompasses three basic steps: familiarizing with the content, applying open coding to content and organizing codes into themes. Structural, descriptive and process coding were used to capture the essence of the phenomena experienced by the participants. The researcher described in details how different codes (i.e., structural, descriptive and process) were used to assign labels to data. In addition, the researcher gave examples of how material is coded in terms of the research questions and clearly explained why each type of coding is used for this research. The assigned labels are not to narrow or too abroad. Overall, the coding process is clear, and the labels make sense of the collected data and the information that the participants provided. Then, the researcher indicates that pattern coding method was used to group the codes into smaller number of categories. The categories are well created, and not overlapped.

Taken together, the researcher used appropriate methods to collect data. The interview questions are understandable. The codes are meaningful, and well organized into categories.