

Older adult gamers: Patterns of use and opinions on the benefits of digital gameplay

by

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Abstract

In our current aging society, there is a need to focus on successful aging and increasing the quality of life of older adults to allow them to maintain independence and well-being. Digital games are a form of technology that could help. This study consisted of an online survey of 50 older adults (55+) who play digital games. Respondents were recruited primarily from online gaming and social media websites. The questionnaire asked about respondents' characteristics, patterns of use, play with others, game choice, and opinions about the benefits and difficulties of digital games. There also was a specific focus on whether there were any changes in certain psychosocial, cognitive and computer skills. Cognitive abilities had the highest reported increases; however, connecting with others, which may improve social capital, showed an increase as well as computer skills. Cross-tabulations revealed a number of interesting relationships between specific variables that suggest areas for further research.

Keywords: Digital games; older adults; technology; quality of life; social capital; cognitive abilities

Dedication

I would like to dedicate my thesis to my Aunty Mary Downey who was always encouraging and provided light and support to all who knew her. Her death was sad but her life continues to inspire me.

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List of Acronyms

CIHI	Canadian Institute for Health Information
ESA	Entertainment Software Association
OECD	Organization for Economic Co-operation and Development
MMORPG	Massively Multiplayer Online Role Playing Game
WHO	World Health Organization

Glossary

Digital games	Digital games are defined as all computer and video games from every genre and platform.
Flow Experience	Flow experience is when an individual becomes completely absorbed in an activity, narrowing their attention to what they are doing (Hsu & Lu, 2004).
Gerontechnology	Gerontechnology is the field of technology designed specifically for improving quality of life for the elderly, whose specific needs are considered during the design process (Gamberini et al., 2006).
Quality of Life	The World Health Organization (2002) describes it as “a person’s perception of their position in life” (p.12). This can include many contextual areas (such as culture) as well as a complex network of personal aspects (such as physical, psychological and social well-being).
Social Capital	Social capital can be defined as the advantages and resources available through an individual’s connections with others (Cannuscio et al., 2003).

Image: Digital play



1. Introduction

We don't stop playing because we grow old; we grow old because we stop playing. – George Bernhard Shaw (n.d.)

The population of individuals aged 60 years and older is the fastest growing segment of society, with estimates of it tripling by 2050 (United Nations, 2009; World Health Organization (WHO) (2002). There are currently almost 5 million seniors (65+) in Canada, with British Columbia having one of the largest proportions (Statistics Canada, 2011). In Canada, it is expected that seniors will rise from 15% of the population to 23% by 2031 (Statistics Canada, 2011). The first baby boomers hit 65 in 2011, and it is predicted that there will be more seniors than those 14 and under in future years (Canadian Institute for Health Information (CIHI) (2011). Furthermore, for the first time the age group 55-64 is larger than those aged 15-24, indicating an imbalance with the current populations being inadequate to sustain the upcoming retirement population (Statistics Canada, 2011). Furthermore, in comparison to other OECD countries, Canada has one of the highest life expectancies in the world (81 years) (Statistics Canada, 2011). However, life expectancy and quality of life are two different facets, with quality of life requiring further investigation. These current trends have led to the need for increased research (Sheets & Gallagher, 2013).

With many Canadians under 85 having functional capacity, a further investigation on quality of life needs to be considered. It is one thing to live a long life and another to live a happy and healthy long life. Quality of life in older adults has received increasing attention among researchers (examples Bowling and Dieppe, 2005; Depp & Jeste, 2006; Lee, Lan, and Yen, 2011, Sixsmith, Gibson, Orpwood, & Torrington, 2007). A variety of terms have been used to describe maintaining a good quality of life in older adults, such as successful aging and active aging. Although these terms are popular in the existing literature, there needs to be some reflection on the use of this language. Terms such as “successful” aging implies there is unsuccessful aging, and this may give way to ageist perceptions that a person is somewhat lesser if they do not age in the societal view of

“successfully” (Rozanova, 2010). However, all of these terms point to the importance of not focusing on illness but on wellness, which allows for research and discussions that draw attention to older adults being active in their aging, and to being independent in the choices they make, such as where and how they would like to live.

Traditional views on successful aging focused on biomedical considerations (see Rowe & Kahn, 1997), but in recent years a more holistic approach has been applied to concepts of aging. One survey and review by Bowling & Dieppe (2005) found that the most important dimensions associated with aging were psychological well-being, social well-being, and physical health. The Institute of Aging also points to the importance of holistic approaches that consider psychological, social, environmental, as well as biological dimensions of aging when planning interventions designed to improve wellness (Joanette, 2013). Improving wellness in regards to these factors has grown in importance, with a variety of recommendations being made to increase the overall well-being of our aging populations.

One area which has been given some attention in recent years is the importance of technology and aging. With the increased use of technology by seniors (PEW, 2012), there can be questions of how technology can be used to help older adults’ quality of life. In many of the priorities being discussed in research and government surrounding the aging population, both prevention and technology are highlighted (CIHI, 2011; Sheets & Gallagher, 2013; Sixsmith, 2013). Technology may help in many ways, such as through devices to make every day functioning easier and keeping older adults independent (Sixsmith, 2013). Many technologies are developed for various health and safety purposes (including medication monitoring and fall sensing devices) which allow older adults to remain at home longer (Sheets & Gallagher, 2013). There are many ways in which technology may help; however, having too much of a focus on technology for illness and disability is led by an ageist view and may take away from other important benefits (Sixsmith, 2013). Internet access and use within itself may allow older adults valuable access to health information and programs which are an advantage over those who do not have access to them (Baecker, Moffatt, & Massimi, 2012).

One technological area which has been increasing in popularity is the use of digital games in improving a variety of outcomes, for a variety of age groups. Digital games are

defined as all computer and video games from every genre and platform. The possibilities they may afford range from educational (Gee, 2003), cognitive (Boot, Kramer, Simons, Fabiani, & Gratton, 2008), social (Staiano & Calvert, 2011), psychological (Rosenberg et al., 2010), physical (Staiano & Calvert, 2011; Peng, Lin, & Crouse, 2011), and let's not forget the importance of fun (Astell, 2013). Recent research has considered the benefits of using digital games to improve the lifestyle of older adults. Digital game implementation has shown some positive results regarding the well-being of the older population (Rosenberg et al., 2010). It is conceivable that digital games may provide an increase in quality of life in regards to the areas mentioned above.

The Entertainment Software Association (ESA) (2011) reported that 29% of computer game users are aged 50+ (ESA, 2011). However, this has been a demographic that has had limited research done around their gaming practice. Older adult gamers are of interest because of the reasons highlighted previously but also:

1. Older Adults did not grow up in the digital age but were introduced to it later on in life.
2. In general, they are retired or may have more leisure time due to slowing down on workloads and children no longer being at home.
3. This is a fast growing population.
4. There are still limited studies on the benefits of leisure use of technology for this age group.
5. Of the studies done on gaming for older adults more reports are emerging about the possible benefits and specific designs are being produced for this demographic (e.g. Eldergames, 2006; HERMES, 2009, SilverPromenade, 2011).

Digital games may provide a space to develop new connections or build stronger connections to individuals already known. There are many opportunities for increased socialization through online games, or playing with others, including grandchildren (Khoo, Cheok, Nguyen & Pan, 2008; Volda & Greenberg, 2012). Intergenerational relationships have been found to be important in helping older adults sense of well-being (Weintraub & Killian, 2007, Meshel & McGlynn, 2004). Digital games offer a medium where these interactions can occur (Khoo et al., 2008).

A certain amount of cognitive decline is considered to be a natural part of the aging process. The possibility for digital games to keep older adults cognitively active has been gaining interest among researchers (Gamberini, Alcaniz, Barresi, Fabregat, Ibanez, & Prontu, 2006; Basak et al., 2008; Whitlock, Mclaughlin, & Allaire, 2012). This growing interest is reflected in the many brain games designed for this specific purpose. However, studies have also examined how regular games may contribute to mental stimulation. For example, some studies have found that using digital games that demand a high level of attention, such as World of Warcraft and Rise of Nations, improve cognitive function (Basak et al., 2008; Whitlock et al., 2012).

Digital games for fitness and health have also received attention as tools for maintaining physical and cognitive health (see Maillot, Perrot, & Hartley, 2012; Anderson-Hanley et al., 2012). Platforms such as Wii Fit and Xbox Kinect have increased access to these forms of intervention. For example, Wii Fit was found to have the benefit of improving balance in older adults (Peng et al., 2011). Some researchers have also begun to design exergames specifically aimed at the older population (see SilverBalance) (Gerling, Schild, & Masuch, 2010).

Investigations on using digital games for therapeutic purposes have also proven interesting. These types of games may help with such areas as rehabilitation and prevention (Wiemeyer & Kliem, 2012). Digital games may offer a relief from chronic diseases and painful treatments (Gamberini et al., 2008). For example, a study by Schneider, Ellis, Coombs, Shonkwiler, & Folsom (2003) used games to help breast cancer patients through chemotherapy, and they had some positive results in distracting participants from the side effects involved with the treatment.

Along with these benefits come certain limitations and concerns that need to be addressed, such as the ability to use a mouse or other devices (Ijsselsteijn, Nap, de Kort, & Poels, 2007). Furthermore, games addiction has garnered a certain amount of attention from researchers (Grüsser, Thalemann, & Griffiths, 2006). It has also been suggested that many commercial games may not be as accessible for frail older adults (Gerling, Schulte, & Masuch, 2011). Older adults may also have technology related concerns, such as security and difficulty with poorly developed features (Mitzner et al., 2010).

As outlined above, there are many reasons why this demographic is of interest to researchers, and why the possibilities of digital games to improve quality of life presents a promising and engaging intervention. However, at this point there is very little known about older adult gamers, their gaming practices, and perceptions regarding the potential benefits of playing games in their lives. Some studies have found that older adults play at a high level of frequency, slightly more women than men play, and that older gamers are more likely to use a PC as their platform of choice when playing digital games (Lenhart, Jones, & Rankin Macgill, 2008; ESA 2012). However, there are not many studies that address the perceived benefits and difficulties of older adult gamers who currently play.

Another reason that it may be beneficial to understand the gaming practices of older adults is that the aging population are at risk of being part of the “digital divide” (Mordini et al., 2009). However, this gap is closing and many older adults now use computers fairly regularly (McMurtrey, Downey, Zeltmann, & McGaughey, 2011). As with other age groups, there is still the digital divide in terms of socioeconomic status, and these may be the older adults who could most benefit from technology (Sixsmith, 2013). Digital games may be a way to educate older adults and increase computer and Internet skills (Wang, Lockee, & Burton, 2011). In a recent survey of Chinese older adults who played digital games, they perceived digital games in a positive way and believed it helped them with computer skills and kept them cognitively active (Wang et al., 2011).

In spite of the possible benefits that digital games may provide to an older population, very little is known about the current practices and opinions of older adults who use digital games. A first step in determining whether digital games are of benefit is to learn from the experience of those who are regular players. As pointed out by Bowling & Dieppe (2005), “there is little point in developing policy goals if elderly people do not regard them as relevant (p.1550).” Thus, it is importance to find out what older adults who play digital games feel are the positive and negative effects of this activity. This will help to inform practice and future implementation by having a better understanding about what is currently working for this population, and what is not.

1.1. Purpose

As new information is emerging about the possible benefits of digital games, it is becoming increasingly important to understand how older adults who currently play digital games experience them. The purpose of this study was to explore the practices of older adult gamers and their opinions on the benefits and difficulties of digital gameplay. It is important to investigate, not only their behaviours, but also to understand their thoughts on the possible benefits, especially in relation to areas that may improve quality of life. For this reason the study focuses on whether older adult gamers believe there was an increase or decrease in certain aspects of psychosocial, cognitive, and skill development through their experience of playing digital games. Although some digital game surveys have included the older adult demographic, there are very few studies that have focused specifically on this age group. This study was a preliminary study for a larger study entitled “Aging well, can digital games help?” A survey was chosen to get a level of generalizability and recruiting online was chosen due to it being a place where older adult gamers who play games online are likely to be found. This study may help to inform future research and design in the area of older adults and digital games.

1.2. Research Questions

1. What are the characteristics of older adults who play digital games?
2. What are the patterns of use of older adults who play digital games?
3. What types of games do older adults play? Do they play with others?
4. What are the opinions of older adult gamers on the benefits and difficulties of playing digital games?
5. What are the relationships among older adults’ characteristics, patterns of use, and play with others with their opinions of the benefits of digital games?

2. Literature Review

2.1. Aging Society

The older population is the fastest growing segment in society, with estimates of it tripling by 2050 (United Nations, 2009; WHO, 2002). Increasing life-expectancy brings with it both challenges and opportunities. Previous discussions regarding the growing aging population have often focused on the financial challenges to current economic practice and pressures on medical systems. Improving health and wellness in the older population can benefit both the individual and society since it will lead to a better quality of life for the individual and less financial support for society. Many older adults share a variety of concerns related to the process of aging, and the level of concern can be very different for each individual depending on their life course.

The aging population and current trends become important to Canada, and much of the world, for a variety of reasons; traditionally, in terms of retirement systems and health care; however, more recently issues such as those related to quality of life are emerging as a focus in discussions and research (Sheets & Gallagher, 2013). The traditional concerns, although sometimes dominant in public arenas, are still up for criticism. For example, there seems to be some debate about the extent that health care systems will be impacted due to the fact that many older adults currently live healthy lives (McDaniel & Rozanova, 2011). Some efforts to address the concerns of pressure on the health care system have been centered on “integration of health care, health promotion/disease prevention efforts, and technologies to support care for older adults in diverse settings” (Sheets & Gallagher, 2013, p. 4). While the Institute of Aging (IA), after conducting a survey on the needs of older adults in Canada, highlighted two main broad themes for their 2013-2018 strategic plan: “optimizing population health and wellness over the trajectory of aging” and “addressing the complex health challenges of older adults” (Joanette, 2013, p. 210). Along with these issues is a growing interest in education for the aging (McDaniel & Rozanova, 2011) and how to make these older adult cohorts healthier and happier.

Many older adults share a variety of individual concerns related to the process of aging. The majority of individuals under 85 did not report functional limitations, and thus they were able to complete everyday tasks (CIHI, 2011). Nevertheless, everyday living can become more difficult with increased concerns, such as fractures, isolation, physical ailments, and cognitive decline (WHO, 2002). Before the age of 85 one of the main health changes that occur with age is an increase in chronic disease (examples – heart disease, cancer, arthritis) (CIHI, 2011). Although many individuals with less fatal chronic illness can still function normally, some of the conditions can hinder general health and well-being (Sixsmith, 2013). Furthermore, although individuals in Canada have relatively good health, there is still a certain amount of natural decline that occurs in many biological functions, such as various cognitive faculties. Thus, there has been a focus on finding ways to improve and maintain healthy cognitive function and dementia prevention (Sixsmith, 2013). Another concern for older adults is a possible tendency towards isolation and loneliness. These conditions are unpleasant for the person to begin with, but they have also been found to have a significant relationship to decreasing other areas of health (Luanaigh & Lawlor, 2008).

Various discussions have revolved around age and aging, and at times societal views have been fairly extreme and often contradictory to each other (Gilleard & Higgs, 2011). Some researchers have classified aging into certain phases of the life cycle. For example, Laslett (1996) discusses four phases of aging. The first age is marked by childhood dependency; the second age by independence, employment, and maturity; the third age (young-old) is marked by a reduction in employment and family responsibilities and thus having more free time to pursue a better quality of life (Wiggins, Higgs, Hyde, & Blane, 2004); and the fourth age (old-old) is marked by a level of dependency and decline. The older population tend to fall into the two categories of the third and fourth age. In modern society, it is difficult to determine the exact time when the third age begins, particularly as retirement occurs at different times for many individuals, just as childbearing and other traditional markers have large variance. The significance of free time in the third age can produce numerous benefits and difficulties, and this accompanied by a slow decline in many areas raises many questions, such as what can be done to help improve and maintain quality of life in this growing population? However, some have warned about classifying individuals into aging categories, particularly as the fourth age may appear to

take on a negative tone. Although Laslett (1996) expresses that he only intended the divide to help clarify specific issues that arise, it may also lead to what Gilleard & Higgs (2011) describe as the abjection of aging, with individuals in the fourth age tending to embody a negative image. Baltes & Smith (2003) warn that research needs to consider both the two faces (gains and losses) of human aging. In a gains perspective old age brings with it much latent potential that can be stimulated; whereas the losses must respect that the human body and mind do decline and that dignity in living and dying must also be maintained (Baltes & Smith, 2003). When considering the changes that occur as we age, it is important to look beyond perceptions of a negative decline and decreased performance, as there are also many individuals that gain knowledge, wisdom, and an in depth understanding from a life of experiences (Hummert, Garstka, Shaner, & Strahm, 1994). Retirement and heading into the third, or fourth age, does not need to be considered a time of withdrawal but one where further exploration in life can be created (Whitcomb, 1990). And thus, when beginning to look at quality of life, active aging, or successful aging, there is rarely one clear answer, but a variety of considerations based on the individual's understanding of life and the trajectories within their life course.

Quality of life remains a vague and elusive term (Sixsmith et al., 2007). The World Health Organization (2002) describes it as “a person's perception of their position in life” (p.12). This can include many contextual areas (such as culture) as well as a complex network of personal aspects (such as physical, psychological and social well-being). A model that takes a holistic approach in considering quality of life is the Ecological model (Sixsmith et al., 2007). The Ecological model, which was designed to highlight areas of a person's everyday life, is formed by a variety of factors “including attributes of the person (functional ability, cognitive ability, psychological factors etc... and attributes of the immediate (formal support network, social network, physical environment) and wider socio-cultural contexts” (Sixsmith et al., 2007, p.5). All of these factors can influence each other, and in combination can determine the individual's level of well-being; thus, they have an ecological relationship (Sixsmith et al., 2007). Quality of life can be very individual and often incorporates a holistic approach.

Similarly, successful aging has been defined in numerous ways without a single definition being accepted (Depp & Jeste, 2006; Lee et al., 2011). It has often been used as an outcome indicator for other measurements, such as quality of life (Bowling & Iliffe, 2006). Originally, when considering successful aging, a biomedical model was used which gives precedence to increasing old age and having physical and cognitive health (Rowe & Kahn, 1997; Bowling & Dieppe, 2005). Although this is valuable, other areas are also crucial to maintaining health, and living and dying with dignity (Baltes & Smith, 2003). On the other hand, there are also sociopsychological models which tend to emphasize life satisfaction, social interactions, and psychological resources (Bowling & Dieppe, 2005). It has been suggested that successful aging requires a more holistic approach which takes into consideration biopsychosocial factors and individual perceptions (Depp and Jeste, 2006; Bowling & Dieppe, 2005). It should not be considered simply success or failure as the terms imply, but should consider success as a flexible line (Bowling & Dieppe, 2005).

Considering older adults' perspectives of what they believe is successful aging is also important. A study by Bowling & Dieppe (2005) found that out of the 854 individuals surveyed, the factors of greatest importance to successful aging included physical health (68%), psychological health (48%) and social activity (38%). Consistent with these findings, Lee et al. (2011) tested a model of successful aging which included physical, psychological, and social aspects but also added leisure activities to this and found that all of these were significant. It was also noted that these ideas did not vary between males and females.

It has been argued that success should not be categorized by a specific characteristic, but instead by the individual's ability to make the best out of current circumstances (Hutchinson & Nimrod, 2012). One consideration for successful aging is the individual's ability to stay actively engaged in life, which is where the importance of leisure activities often comes into play. The simple act of participating in an activity may help to improve health and well-being (Matsuo, Nagasawa, Yoshino, Hiramatsu, & Kurashiki, 2003). Some studies have found that leisure activities have an impact on individual well-being in older age (Menec, 2003; Matsuo et al., 2003; Hutchinson & Nimrod, 2012), and can reduce the risk of dementia (Verghese et al., 2003). After experiencing debilitating conditions, older adults will often use numerous methods to keep involved in leisure activities, as these activities can provide a sense of meaning,

accomplishment, and satisfaction (Hutchinson & Nimrod, 2012). When leisure activities are chosen for their positive abilities to improve health or well-being, it can encourage feelings of competence (Hutchinson & Nimrod, 2012). Leisure activities can often cross over to improve the physical, psychological, and social aspects of an individual's life (Menec, 2003). However, the type of leisure activity may be crucial to whether it can improve well-being (Wang et al., 2006). Within ideas of leisure activities and staying active in life, technology provides an important role in older adults' lives and may offer many benefits for increasing and maintaining successful aging and quality of life.

A theory that can provide a more holistic approach to aging is life course theory, also called life course perspective. A life course can be considered as "a sequence of age-linked transitions that are embedded in social institutions and history" (Bengtson, Elder Jr, & Putney, 2012, p. 10). Life course is different from life span, life cycle, or life history; however, these can be discussed within a person's life course. Life course theory considers many aspects that affect a person's life and how the interplay of different trajectories influence and create the individual's life course (Elder, 1994). Furthermore, it extends across time so that decisions made when an individual is younger affect their later life (Elder, 1994). It also observes life as incorporating various points of transitions that may lead to changing roles and status (Hutchinson, 2011). For older adults, there are numerous transitions that occur with aging that can affect various trajectories. Trajectories are more long term patterns that usually involve many transitions (Hutchinson, 2011).

Life Course Theory considers a number of factors but incorporates four main themes: socio-historical perspective, life timing, linked lives, and human agency (Elder, 1994). A socio-historical perspective considers the importance of the birth year and what is happening historically for a person at different times of their life due to this. There is a certain cohort effect but this is mainly due to events occurring for these groups at the same time (Elder, 1994). Historical points can affect a person's life course. For example, within the older generations they were born just after WW2 or before this time. The sequence of events along their life course may be very different from someone of a different generation. Thus, if they grew up as a child during WW2 it meant rationing food and possibly parents that were very busy; whereas, if they were adult men it may have meant they went off to war. Life timing on the other hand is "the incidence, duration, and sequence of roles, and to relevant expectations and beliefs based on age" (Elder, 1994, p.6). It considers the

timing of events along the interweave of trajectories; thus, such things as the age that an individual has children can affect career, marriage and other trajectories in the person's life. The decisions are also influenced by social norms of the time and the consequences of timing may differ greatly at different points in history. Thus, the effect of social change will impact the life course in a variety of ways depending on where the person is at. For example, when considering technological advances such as the Internet, how this affects the person may depend on whether they are still working or whether they have retired. Linked lives on the other hand is the idea that each individual life is "embedded in social relationships" (Elder, 1994, p. 20). None of us live solely on our own but we are interdependent on each other; thus, our life course is also influenced and dependent upon others, particularly those within our immediate community. Finally, human agency is our ability to make choices. These choices are crucial in the effect they have on our life course. Although individuals have certain constraints, they also plan and guide their own life course (Elder, 1994, p.20).

A life course perspective can be useful in studies that look at older adults to give a better understanding of the individual lives involved. It allows for a consideration of the historical events that may have affected the life course, while also considering the social influence of the people and events around them, and the choices they make.

2.2. Aging Society & Technology

Technology may have an interesting role in the life course of many older adults. Firstly, the complexity and advancement of technology has changed quickly during the lifetime of most individuals. Although younger generations may not remember a time when computers or the Internet were not around, older adults may remember early adoption of such devices into the workplace or home. Various changes and challenges may have occurred with the introduction of such technology into peoples' lives that may have affected the trajectories of their life course. Even the possible ways in which social interaction occurs has been influenced by technology advances.

Technology use for older adults has been a developing field of enquiry. Technology has been used in numerous ways to increase quality of life in the aging

population (e.g. Assistive technology, social connections, cognitive training, information, self-esteem, health & safety) (Bouma, Fozard, Bouwhuis, & Taipale 2007; Gamberini, et al., 2006). Overall many older adults find the benefits of using technology to outweigh the costs (Kiel, 2005; Mitzner et al., 2010). There are various studies that have looked at the perceived benefits and barriers in computer use for older adults (Kiel, 2005; Gatto & Tak, 2008, Mitzner et al., 2010). The main benefits of computers that older adults seem to perceive are: a sense of connectedness, keeping in touch, satisfaction, utility, convenience, and positive learning experiences (Gatto & Tak, 2008; Kiel, 2005; Mitzner et al., 2010). Barriers that came out in various studies were: frustration, physical and mental limitations, mistrust, and time issues (Gatto & Tak, 2008; Kiel, 2005; Mitzner et al., 2010). Furthermore, in a study by Lehtinen, Näsänen, & Sarvas (2009), they found that many of the baby boomers interviewed had beliefs that the Internet is unsafe and social networks are often the place of unacceptable behaviour. However, in other cases the stereotype of older adults being afraid of technology does not stand true (Mitzner et al., 2010; Kiel 2005). There seems to be a specific divide between those who use computers and those who do not (Cresci, Yarandi, & Morrell, 2010).

Due to the many benefits and uses of technology, particularly access to information and social networks, technology use may create a specific advantage for those that use it and those that do not may lose out. Furthermore, there is also a divide between the younger population who have grown up with many technological systems and those who have not. Older adults still tend to have a lower percentage of computer users compared to other age groups, and it has been suggested that there may be a digital divide (Kiel, 2005; Mordini et al., 2009). The UK and EU have specific programs targeted on reducing the divide between young and old technology use (Mordini et al., 2009). However, other research has suggested this gap is closing, and that many older adults use computers fairly regularly (McMurtrey et al., 2011; Zickuhr & Madden, 2012). A recent survey by PEW research on older adults' use of the Internet suggests that 53% of Americans aged 65+ use the Internet (Zickuhr & Madden, 2012). This is the first time that this survey has found that over 50% of older adults are using the Internet, and although this is less than other groups, it is still a large percent. Furthermore, the number of older adults using the Internet has more than doubled over the last 10 years (Zickuhr & Madden, 2012). Furthermore, once older adults begin to use the Internet they often become regular users (Zickuhr &

Madden, 2012). However, there is still a significant difference between the young-old and old-old in this study, in that only 35 % of those in the age group 75+ used the Internet or email (Zickuhr & Madden, 2012). A more specific look at who uses the Internet in the older demographic can be seen in a study by Cresci, Yarandi, & Morrell (2010), who describe a divide between the pro-nets and no-nets. They found the no-nets had resistance to using the Internet. They were often older, less educated, had less income and were often in poorer health. Thus, they possibly had the most to gain from using the Internet.

Older adults have a large variety of needs, and to address some of the barriers that are specific for this demographic, technology is being specifically designed to help older adults manage their lives (Gamberini et al., 2006). Gerontechnology is the field of technology designed specifically for improving quality of life for the elderly, whose specific needs are considered during the design process (Gamberini et al., 2006). It is the interaction of two specific areas of current society; that of the increasing aging society, and that of the technology revolution (Bouma et al., 2007). This has moved technology into a more user-driven approach, and considers the needs and resources of the aging population. However, technology does not need to be specifically designed for older adults to be useful. For example; two health-related areas of Internet use that have developed and are of importance to older adults are health information websites and health support social media (Baecker, Moffatt, & Massimi, 2012). These are both important aspects, and these alone may determine a level of information that can give older adults with access to technology an advantage over those who do not have access.

Besides health reasons, technology has also provided many quality of life opportunities by providing a medium for social contacts (Nimrod, 2010). One of the advantages of technology is it can provide entertainment, an avenue for communication and socializing, which to some degree can fulfil our need for love and belonging (Baecker et al., 2012). In a society where families are often spread apart by great distances, technology can allow individuals to keep in touch with friends and family worldwide. On the very basic level, tools such as email and social networking may keep individuals in touch with friends and family. Of the American older adults (65+) who use the Internet, 84% use email and 34% use social networks (Zickuhr & Madden, 2012). In 2009 the number of Internet users 65+ who used social media was 13% which represents significant

growth over the last few years. Technology may provide an opportunity to meet new friends or form support networks online.

Technology may be a source of forming social capital. The term social capital has been defined and measured in numerous ways with limited agreement on the exact terminology (Cannuscio, Block, & Kawachi, 2003). Loosely, social capital can be defined as the advantages and resources available through an individual's connections with others (Cannuscio et al., 2003). Social capital has been found to have a specific relationship with the perceived well-being of older Canadian adults (Theurer & Whister, 2010). Research has often shown that one of the main areas that influence older adults' quality of life is their interactions with others and social support (Adams, Leibbrandt, & Moon, 2011; Reichstadt, Sengupta, Depp, Palinkas, & Jeste, 2010; Theurer & Wister, 2010). Furthermore, the type of social capital seems to have an effect on well-being, with those having the most diverse connections often showing the highest sense of well-being (Litwin & Shiovitz-Ezra, 2011). Through social networks, emails, online games, and forums, older adults may be able to form important connections to family, friends, and health professionals. Furthermore, technology may provide access to entertainment, while also increasing feelings of being a part of a changing technological world (Astell, 2013).

Technology can also provide a level of engagement and entertainment that can be both entertaining and stimulating. The unique ability for computers to provide an environment where individuals can often have a level of selective timing for pursuing leisure activities has an added advantage as it can be accessed at any time, and from any location where a computer is available (Nimrod, 2011). Its use as a casual leisure activity and social networking tool may also provide many benefits. For example, Nimrod (2011) found that many current online seniors' communities tend to have the dominant theme of fun within their posts, with many of the posts relating to online games. Within older Internet users games have often been reported as one of their preferred Internet activities (Cresci, Yarandi, & Morrell, 2010; Nimrod, 2011). Games may provide the aging society with a unique opportunity for play and improving quality of life.

2.3. Overview of Digital Games

One area that has been increasing in popularity is the use of digital games in improving a variety of outcomes, for a variety of age groups. Digital games are defined as all computer and video games from every genre and platform. The possibilities they may afford range from educational (Gee, 2003), cognitive (Boot et al., 2008; Whitlock et al., 2012), social (Staiano & Calvert, 2011), psychological (Rosenberg et al., 2010), and physical (Staiano & Calvert, 2011; Peng et al., 2011). Recent research has begun to consider the benefits of using computer games for therapy and leisure to improve quality of life for older adults. The positive and negative effects associated with playing digital games has undergone many discussions and debates from media and academia alike.

2.3.1. Effects of Games

With the increase in research on the use of computer games for learning, cognition, and other areas there are still many questions to be answered (Gee, 2011). The history of the gaming debate has often been centred on various issues including, the influence of games (sometimes focusing heavily on violent video games), what to consider when looking at games, and what is the transfer of learning and experience from game play.

A variety of research has looked into the effects that video game content has on players (Dandeneau & Baldwin, 2004; Simkins & Steinkuelher, 2008; Greitemeyer & Oswald, 2010). One area of concern, that has had plenty of media coverage, is whether violent video games promote violent behaviours in its users (Anderson & Bushman, 2001; Greitemeyer & Oswald, 2010). This controversial issue is still a much debated topic in the media, as many argue that the effects of game play are far more complex, and some argue that the simple act of playing violent games does not necessarily lead to actual violence (Devane & Squire, 2008; Simkins & Steinkuelher, 2008; Gentile, 2011). On the other hand, if video games can promote violent behaviours in some players, then it suggests that prosocial games could also promote prosocial behaviours. Indeed, this has led to further research that has found digital games can have an effect on prosocial behaviour (Gentile, Anderson et al., 2009; Sestir & Bartholow, 2010; Greitmeyer & Oswald, 2011). The idea that the content of games can have an effect on individual personalities and behaviours has also been used in an attempt to increase self-esteem (Dandeneau & Baldwin, 2004).

Research at McGill University has been looking into how psychologists can use computer games to alter individual's perceptions and increase self-esteem by changing players negative thought patterns through a repetitive game requiring the players to search for approving faces (Dandeneau & Baldwin, 2004). Although the game is simple, it may suggest that games might be a persuasive form of learning and altering self-perceptions. However, the studies mentioned above tend to ignore the complex individual experience and understanding that shape individual's choices. Along with looking at the effects of content, many studies have begun to explore how games can be used to influence other aspects of an individual, such as using exergames to promote health (Heick, Flewelling, Blau, Geller, & Lynskey, 2012), using them as tools to stimulate cognition (Whitlock et al., 2012) and as agents for increasing socialization, and feelings of well-being (Jung, Li, Janissa, Gladys, & Lee, 2009). These areas will be looked at in more depth in regards to the experiences of older adults, and the possibilities of using digital games as a positive therapeutic or leisure activity. However, content and game type cannot be ignored as possible influences, and are worth considering.

2.3.2. Game Type

The wide variety of digital games that are currently available also bring about numerous possibilities of how a person may interact and experience digital play. Such characteristics as the ludic and/or narrative qualities of a game can be influential to how the individual experiences the game. Within game research and discussions, digital games have sometimes been looked at either through narratology (games as media) or ludology (games as play) (Squire, 2008). Although traditionally these were seen almost as competing forces, recent discussions have been more in line with considering both ludic and narrative influences in games. The ludologists were often offended at the idea that games would have any comparison to other story telling media, and proclaimed that story is just used as something to sell the product (Squire, 2008). In games such as Tetris, which has very little to do with narrative, it can be plainly seen; however, when you get to games such as Skyrim, or multiplayer games like World of Warcraft, it is undeniable that some of these games have narrative that are used for a certain purpose (Jenkins, 2004). It is often through narrative that meaning making occurs (Barab, Gresalfi & Ingram-Goble, 2010). Jenkins (2004) argues that we do not need to ignore one for the other. However,

we cannot simply look at narrative within games in the traditional sense, and under the traditional rules. Thus, a clear definition of what is meant by narrative in games needs to be understood and considered in conjunction within the context of the ludology of the game. Increasingly, researchers are considering the ludic and narrative attributes of games as being mutually important, and it is their interaction within the game space that may make video games a powerful medium with multiple purposes (Jenkins, 2004; Simkins & Steinkuelher, 2008; Squire, 2008).

There are many ways to categorize or analyze different game types (eg. genre, style, and device). For example, one aspect of game type that is worth mentioning is whether they are casual or persistent games. Casual games are short games that are played over a few minutes or hours and once the person stops playing the game stops (Schultheiss, 2012). These include a lot of popular puzzle games & card games. On the other side, there are persistent games which are played over a long period of time (days, weeks, months, years) (Schultheiss, 2012). These include Massively Multiplayer Online Role-Playing Games (MMORPGs) and other games that can be played over time with or without others. MMORPGs are games that are persistent virtual worlds that players can log onto whenever they want and can interact with other online players within the game.

When discussing games used for certain purposes, the style and type of game may influence different cognitive processes of an individual. To consider games in relation to enhancing older adults' quality of life in some manner, the effect may vary depending on game choice and the individuals understanding and experience of the game. Aspects such as whether it is played for pure entertainment, whether there are social elements, whether it has a storyline that is intriguing, or other characteristics may influence the player. For example, some research into gameplay by older adults suggests that the playing experience was enhanced by embedding narratives into games (Chu Yew Yee, Duh, & Quek, 2010). The researchers proposed that this stems from behaviour science which suggests older adults work better at a discourse level. Game type may also determine other areas, such as amount of time and commitment.

2.4. Older Adult Gamers: Characteristics, Learning, Psychosocial, Cognitive, and Physical Considerations

As mentioned earlier, discussions of successful aging have begun to include leisure activities as an important aspect of quality of life. Digital games may offer a variety of opportunities, not simply as a leisure activity, but due to the opportunities for stimulating different faculties, engagement and socializing. At this point there have been limited studies investigating older adult gamers, sometimes called silver gamers (Shultheiss, 2012). Considering the potential, the growing use of digital games, and current interest in older adults and technology, this demographic has been largely ignored in game studies. There have only been a small number of qualitative and quantitative studies exploring the behaviours and experiences of older gamers who already play games. Of these studies there is also no set age for classifying older gamers. Even between the Canadian ESA (Entertainment Software Association) and American ESA (Entertainment Software Association) they differ by 5 years. Some studies have also looked at baby boomers which could be included as they are part of the age group that currently moving into the older adult category.

In a survey conducted by the ESA of Canada (2012), it suggested that there was a wide age range in Canadian gamers. The American ESA (2011) reported that 29% of digital game users are aged 50+. A further split in the ages by Pew surveys found that 23% of individuals 65+ played digital games; while 40% of adults between the ages of 50-64 played digital games (Lenhart et al., 2008).

2.4.1. Characteristics

Who is Playing

It is interesting to determine which older adults are playing digital games. Previous studies of older adult digital gamers have found that they tend to be well educated (De Schutter, 2011; Pearce, 2008). However, studies that included all age groups have found that gamers tend to have a medium to high education (Lenhart et al., 2008). Within a study by Pearce (2008), that surveyed 271 baby boomer gamers, it was found that over half of respondents had wages that were above average (\$70,000 +). Of the baby boomer gamers surveyed by Pearce (2008) over 2/3 were married, and many respondents lived

with other relatives (either children or older adults, such as parents or other relatives). A large portion of respondents in the few surveys conducted were in a partnership of some sort (De Schutter, 2011; Pearce, 2008). In a survey of a 124 older adults (aged 45-85), De Schutter (2011) found that 59% had grandchildren. Of the respondents of the study, none lived in a care facility but were independent (De Schutter, 2011). Many studies seem to imply that there is a fairly even ratio of male/female gamers, with many studies showing slightly more women players (Pearce, 2008; De Schutter, 2011; Shultheiss, 2012). For example, Pearce's (2008) survey on baby boomers gamers found that over half were woman. This is consistent with findings from De Schutter (2011) where over half of the respondents were also women. A more recent study looking into the MMORPG game Wizard 101 found that 62% of players over the age of 50 were women (Delwiche & Henderson, 2013).

What They Play on

The computer (PC) seems to be the main platform that older adults use for playing games (ESA Canada, 2012; De Schutter, 2011; Pearce, 2008). A survey of Canadian gamers conducted by ESA Canada (2012) found the number to be around 68%, with around 30% of older adult gamers playing online. The PC was the main source of gaming in the baby boomer survey, with 98% of respondents using this platform, whereas the more portable game platforms and consoles were considered by the participants as being mainly for the younger generations within the households (Pearce, 2008).

Game Preference

Since the PC is the main platform for older adults, it is not surprising to see that the game preferences are often those that are played on a PC. Most of the larger studies suggest that older adult gamers are mainly casual gamers (66%), who prefer puzzle games, card, arcade or word games (ESA Canada, 2012). ESA Canada (2012) suggested that this was the most common game for both males and females. Females particularly fell into the casual gaming category within the study by De Schutter (2011). De Schutter (2011) found that 80% of the older adult gamers surveyed were casual gamers, the other 20% had a wide range of game preference. In a smaller focus group study by Nap, de Kort, & IJsselsteijn, (2009), it was found that the most common games played also fell into this category (ex. solitaire and Bejewelled).

On the other hand, Pearce (2008) conducted a survey of baby boomers and found that they were mainly interested in role playing adventures or mystery games. In the study by Pearce (2008) she found that 30% of baby boomer gamers surveyed played MMORPGs. It should be noted that this study recruited through online sites which may have a certain influence on the types of players attracted. De Schutter (2011) also found that so called “hard core” gamers were much more likely to be men and of a younger age. However, a more recent study by Delwiche & Henderson (2013) on people who played the MMORPG game Wizard 101 found that players over 50 were more likely to be women. Interestingly, Nap et al. (2009) found that some of the older adults had a desire for more narrative style play; nevertheless, they found some of the current narrative type games moved a little too quickly. The story and fantasy aspects may appeal to some individuals. This is an interesting area to explore as a narrative element can contextualize the experience (Barab et al., 2010). Aison et al. (2002) found that older adult non-gamers, who were presented with games, preferred those that had familiar content and that they could use some prior knowledge to negotiate with the game space. However, this may differ for older adults who are already comfortable with gameplay, in that many adult gamers who are regular users may enjoy a wide range of games. It also seems that those that have increased flow experience when faced with a game were often those that had previous experience with playing digital games (Gerling et al., 2011). Flow experience is when an individual becomes completely absorbed in an activity narrowing their attention to what they are doing (Hsu & Lu, 2004). As pointed out earlier, there is no set age so this may be part of the mixed results. Each game may enhance a different aspect of cognitive abilities, or some may have more social elements versus a solitary environment. As mentioned earlier, the ludic and narrative aspects of games may also influence the experience.

Although there are only a few studies of older adult gamers, most have found that solitary PC games tend to be the main preference (De Schutter, 2011; Nap et al., 2009). In contrast, Pearce (2008) found that many of the baby boomer gamers in her study were social gamers. Possibly this was due to the fact that the study was conducted with individuals online. It may be possible that the online demographic uses more interactive games. As Pearce’s (2008) study is also focused on baby boomers it may be related more to a trend of upcoming older adults. However, the ESA Canada (2012) found that 30% of

mature gamers are spending more time online playing games. Whether an individual plays games with others or alone may be significant to the type of experience they get out of the gameplay, especially in regards to social aspects. For those that play games with others it may be a source of socialization and companionship. Of the games that can be played with others, MMORPGs are of interest, although it seems only a small percentage of older adult gamers play within these virtual environments. The Pew survey found that neither social Internet games nor MMORPGs were used very often by the 65+ age group (Lenhart et al., 2008). However, there are various studies that still show some individuals within the older adult demographic play MMORPGs (Williams, Yee, & Caplan, 2008; Debeauvais, Nardi, Schiano, Ducheneaut, & Yee (2011). A study by Williams et al. (2008) that surveyed 7000 gamers who played Everquest found that only 4.8% were between the ages of 50-65. Within another study of MMORPG players, who played the game World of Warcraft, it was found that 8% of American players surveyed were 45+ (Debeauvais et al., 2011). Although this was not a large number, it was still significant and of importance. Interestingly, the older adult gamers in the study were the most consistent players, and thus were less likely to stop playing or have breaks.

Time Spent

On average older adult gamers have been playing for 14 years (ESA, 2012). Lenhart et al. (2008) found that of the older adults gamers surveyed (aged 65+), 36% reported playing digital games with a high level of frequency (everyday) (Lenhart et al., 2008). This is consistent with ESA Canada's (2012) findings that 32% of mature gamers (55+) play every day, and 41% reported playing a few times per week. These studies are interesting as it seems that older adults become regular users of games once they begin. One study of older adults (age 50+) who play specifically Internet games found that many users had a high usage in one session of about 2-4 hours per day (Schultheiss, 2012). Consistent with this high use, Delwiche & Henderson (2013) found that players of Wizard 101 played much more than their younger counterparts; however, they also underestimated the time spent. These findings coincide with De Schutter (2011) survey, which found that social interaction was a predictor of time spent within a game. As the Internet may be a source of socialization with others the two may work together.

Motivation

Results of the various studies suggest that motivation was based on relaxation, ability to role play, and challenge (cognitive stimulation) (Nap et al., 2009), with challenge often being the most prominent motivation (Pearce, 2008; De Schutter, 2011). The idea of using games for simple entertainment, to pass the time, or for fun is not surprising (Nap et al., 2009; Wang et al., 2012). The idea of game use for fun is also consistent with Nimrods findings that many older adults online have a certain “fun culture”, and these practices may enhance older adults’ enjoyment, which can partly contribute to quality of life. De Schutter (2011) found that the main motive in playing games was challenge. Of the baby boomers surveyed by Pearce (2008) they preferred games with a narrative aspect and those that provide an intellectual challenge. Wang et al. (2012) found that over half of the older adults in their study believed that games kept their minds active. The fact that challenge is a major motivation is important to those that consider using games for cognitive stimulation.

However, a further exploration of what is meant by fun, challenge, and engagement are possibly needed. Fun can be considered synonymous with enjoyment, yet this can be complicated when discussing fun in relation to games. Games often present challenge and enjoyment at the same time. It has been argued that within digital gameplay players often experience challenge-based pleasure (Sorenson & Pasquier, 2010). Furthermore, when discussing games engagement can also be considered more through ideas of flow (Sorenson & Pasquier, 2010). Thus, fun, challenge, and engagement are often interrelated with each other in gameplay.

Limitations for Older Adult Players

Although there are benefits associated with digital gameplay, there are also limitations. It has been suggested that many older adults when considering whether to use a digital game tend to weigh the costs and benefits (Mclaughlin, Gandy, Allaire, Whitlock, 2012). Violence in video games, usability difficulties, and game difficulties are some concerns cited by those who play games on a regular basis (Nap et al., 2009). In other cases, introducing gaming systems to older adults must also address the players’ ability to use a mouse or other input devices (Ijsselsteijn et al., 2007). Research has also suggested that many commercial games may not be as accessible for use by older, frail

adults, which can make gameplay difficult (Gerling et al., 2011). Games addiction has received a certain amount of attention and poses a legitimate concern for some individuals (Grüsser et al., 2006). Older adults may also have concerns around information security, games with too many or unhelpful features, or concerns about basic computer literacy (Mitzner et al., 2010).

Although these studies begin to give a broad picture of older adult gamers, they do not go into detail of the opinions of players, in regards to areas that recent intervention research has attempted to use games for. Research into using digital games to improve the quality of life for older adults has focused on their use for educational purposes, social interactions, cognitive stimulation, and more recently on using Wii and other exergames to stimulate physical activity. It is worth considering these areas and what has been found through research and interventions.

2.4.2. *Learning Through Games*

There needs to be some consideration for how learning occurs within digital games. From a social constructivist view learning occurs through meaning making, and environments that encourage meaning making are in turn useful for learning. Knowledge is constructed through learners' experiences (Driscoll, 2000) and in this case through gameplay. Furthermore, social interactions become extremely important as part of the process of learning as they are often required for learners to become part of a knowledge community (Vygotsky, 1978). Games within themselves have classically involved social interaction. On the other hand, digital games can be either social or solitary. However, even a solitary game can be used as an artifact in which cultural knowledge and practices can be transmitted through experience.

Digital games designed for educational purposes have become of growing interest to researchers and developers. Currently, the reputation of digital games is in transition from being a medium with a lot of scepticism surrounding it, to a far more acceptable medium for learning (Squire, 2008). The original scepticism was partially due to the fact that games imply play, which often is taken as the opposite of serious study (Squire, 2008). However, play within itself can lead to powerful learning (Vygotsky, 1978; Gee, 2003). Video games are coming to light as a way to engage individuals in academic content,

problem solving, and self-directed learning (Klopfer, Osterweil & Salin, 2009). Through narrative, role play, and experimentation, players can enjoy the freedom to explore in a safe environment (De Freitas, 2006). It is precisely the freedoms that the games afford that make them unique with a multitude of uses (Klopfer et al., 2009). Numerous studies have found digital games to be educationally beneficial for a younger population (Squire, 2008; Chuang & Chen, 2009; Barab et al., 2010); however, there have been limited studies that have looked at the impact of digital games on learning and education for the older generation.

When weighing whether or not to use digital games, the older adult will often go through a cost benefit analysis (McLaughlin et al., 2012). Is the difficulty of learning the game worth the entertainment or other reward? Beliefs about the potential value is an important aspect of computer use, and it has been found that older adults are more likely to use technology if they feel there is a benefit (Melenhorst, Rogers & Bouwhuis, 2006). Hsu and Lu (2004) point out that individuals do not always perceive digital games as useful but as simple entertainment, and so social norms and flow experience become important. There seems to be a distinct benefit on learning how to use a digital game for those that have previous experience. Within SilverPromenade, it was found that older adults who had previous game experience found the game more accessible, and this led to increased state of flow, compared to those who did not have gaming experience (Gerling et al., 2011). It has been argued that individuals with previous scaffolding and prior knowledge have an increase in their flow experience, which makes it easier for learning to occur (Killi, 2005).

Although there are many specific possibilities for using digital games to educate older adults in many content based areas, one educational side effect that can sometimes be seen in the use of digital gameplay is an increased understanding of technology and the Internet (Wang et al., 2011). Older adult learning is markedly different than at other times in life. More specifically, it follows two concepts for choosing to learn; one the individual usually has a need to know why learning something will be of benefit; secondly, self-image, where individuals have to be treated as self-directed learners (Kiel, 2005). On the first point, some older adults have reported that they appreciated the educational value of digital games (Nap et al., 2009; Wang et al., 2011). On the second point, computer engagement and informal learning may be important to the uptake of IT skills and should

not be downplayed as a path to education of computer literacy (Selwyn, 2005). Digital games may form an informal way of engaging individuals in computer literacy. Playing games may be a way to help older adults increase their computer skills by allowing them to have control over their learning. In a recent survey of Chinese older adults who play digital games, it was found that they perceived them in a positive way and believed it helped them with their computer skills and kept them cognitively active (Wang et al. 2011).

Wang & Burton (2010) suggest that there are three reasons that computer games may be explicitly useful in educating older adults on computer skills. Firstly, they are engaging and help to increase motivation; secondly, many games require minimal computer skills to start, yet as they progress there are often opportunities to improve game and computer skills; thirdly, the embedded virtual environments may create opportunity for increased interactions. A few studies seem to suggest that there is an acceptance of the potential of using digital games for learning within the older adult community (Pearce, 2008; Wang et al., 2011; Nap et al., 2009). Of the 40 older adult computer users who played digital games in a survey by Wang et al (2011) 95% of them felt that it had helped them with their computer skills in some way. The main reasons cited for feeling it improved their computer skills were: it gave them practice with functions, increased interest in technology, and simply provided a better understanding of computers, and friends online were able to help them improve their computer skills and understanding while playing the game (Wang et al 2011). This latter point is of particular interest, if compared to the survey by Pearce (2008), where 75% of the baby boomer gamers said that one of their preferred activities was helping new players. This may suggest a level of enjoyment for both mentor and learner that allows for valuable interaction. The interactive aspects of digital games is partially the appeal of using them for learning. Learners can form knowledge through social participation in an online environment where meaning making can occur (Woo & Reeves, 2007).

2.4.3. *Psychosocial Aspects*

Discussions on successful aging and quality of life have begun to explore the importance of psychosocial aspects (Bowling & Dieppe, 2005). As mentioned previously, social capital has been found to be an important contributor to life satisfaction among older adults (Theurer & Whister, 2010). Games that are played with others, either in the same

room or online, may provide a context within which to connect and build relationships, whether with family, friends, or new people.

Some studies have found that individuals that play digital games reported that playing digital games enhanced their social lives and feelings of well-being (Goldstein et al., 1997; Nap et al., 2009; Wollersheim et al., 2010; Allaire et al 2013). One recent study conducted by Allaire et al (2013) found that occasional and regular older adult gamers scored higher on a number of psychosocial categories, including well-being, less depression, and lower negative affect. There are numerous possible psychosocial benefits (increased social interaction, feelings of accomplishment, connectedness) and difficulties (addiction, frustration) that can occur with digital game use. Once again, the type of game may be an important factor. For example, whether individuals play with others will likely influence ideas of whether game players feel that games are social mediums.

Within game research, the old fashioned perspective of the lone gamer who does not socialize has been met with scepticism as many have argued, and research has shown, that much play is done with others (Cole & Griffith, 2007). Games within themselves have historically often been social in nature. For example, playing card games with others was shown to be a way to enhance socialization and as a way to cope with everyday life (Outley & Mackenzie, 2007). The Internet provides individuals with opportunities to explore greater networking and socialization, with gameplay being one possible source of connecting with others. Whether playing with individuals in the same room on a console, or meeting individuals worldwide on large Massively Multiplayer Online Role Playing Games (MMORPG's), the social nature of games persist. It has already been pointed out that increased numbers of older adults are playing online games and are joining social networks. It will be interesting to see whether playing games with others online also begins to increase over the next few years.

Social interaction can be beneficial for many areas of successful aging and successful living in general (Mclaughlin et al., 2012). Within digital games, there are numerous opportunities to socialize; particularly, in interactive games, such as MMORPGs, social network games and traditional board games played online with others. Communication in virtual spaces provides an important opportunity for individuals to express themselves in a different way than what their current life situations usually allow

(Cole & Griffith, 2007). Such factors as gender, sexuality and age may not be important aspects of communication in virtual spaces (Cole & Griffith, 2007). Wang et al. (2011) found that a portion of the older Chinese adults who were surveyed reported that digital games were a good source of socializing. Of those interviewed, 50% played online games where they compete, collaborate, and communicate with others (Wang et al., 2011). They found that whether intentionally, or not, it provided the opportunity for social interaction. However, other research has suggested that many older adults remain as solitary players (De Schutter, 2011; Nap et al., 2009). Older adults who have a higher investment in the games they play tend to have a higher level of social interaction (De Schutter, 2011). However, some older adults expressed a level of concern about playing with others online (Nap et al., 2009). A recent study by Delwiche & Henderson, 2013 found that older adult gamers were less likely to report social interaction as a motivation for gameplay and also spent a lot less time socializing with other players compared to their younger counterparts.

At this point there seems to be mixed results in regards to older adults and MMORPG's. However, in a review of studies on MMORPGs Barnett & Coulson (2010) found there is a wide age group who play MMORPGs, ranging from 12-83. In a study by Cole & Griffith (2007) 75% of gamers surveyed (912 respondents, between the ages of 11-63) claimed that they had made good friends through playing the MMORPG. However, 1/5 believed it had a negative effect on their relations with those they do not play with while 2/3 felt it actually had a positive effect. It was also found that players were more likely to discuss sensitive issues, possibly because of the anonymity. They also suggest that the age range allows individuals to seek advice from older more experienced individuals. As pointed out earlier, the percent of older adults that play MMORPGs is still small. However, interacting and enjoying play with others within a virtual environment may be of benefit to older adults who find themselves isolated.

Many games are specifically being designed to incorporate social elements within them (Shim, Baecker, Birnholtz, & Moffatt, 2010). In a qualitative intervention study of older individuals in a community dwelling who were asked to play Wii together, gameplay was found to increase bonding between the participants (Wollersheim et al 2010). Discussing games within social networks has also been shown to provide opportunities to exchange information and have fun socializing (Pearce, 2008; Nimrod, 2010). Nimrod

(2010) found that older adults used online social website to satisfy their need for play while fostering communication and community.

Intergenerational:

Of the social benefits noted, one that has been of increasing interest, and alleviates a number of esteem issues, is the possibility for digital games to help older adults feel more in touch with modern society and a younger generation (Nap et al., 2009; Wollersheim et al., 2010; Volda & Greenberg, 2009). Environments that create intergeneration contact may be an important source of increased quality of life. Intergenerational relationships between older adults and younger individuals have often been reported to have positive results, including a higher sense of emotional well-being (Weintraub & Killian, 2007) and life satisfaction (Meshel & McGlynn, 2004). The possibility for digital games to bring different generations together has been noted in a variety of studies (Aarsand, 2007; Khoo, Cheok, Nguyen & Pan, 2008; Volda & Greenberg, 2012). This can be an important factor since it allows individuals to feel more connected with a younger generation and may provide the added bonus of them not feeling socially isolated or out of touch. In a study by Wollersheim et al (2010) many of the women found that by participating in the Wii experiment it increased the quality of their relationships with grandchildren. Humorously, there also seems to be a certain aspect of gaming with other generations that is met with resistance by some, since the adults are often the less knowledgeable and do not necessarily enjoy being beaten by their grandchildren (Nap et al., 2009).

Intergenerational play and communication can expand across numerous generations of gamers. As seen in the studies of MMORPGs players ranged from age 12-83 and play together (Barnett & Coulson, 2010). One respondent in the qualitative section of the study by Pearce (2008) played games with her children and grandchildren, and it formed a large part of their communication and socialization. Through the intergenerational play she formed a role as the de facto gamer “grandma” to a group of teens in the gaming community. The respondent went so far as to start an online youth group within a social network site related to the game. This interesting story of a 59-year-old, who has managed to build a friendship with a group of 15 year olds, while also mixing

with the various generations of her own family, highlights the possible potential of gaming communities for intergenerational interactions.

Some games are being specifically designed to enhance the ease of intergenerational play (e.g. Age Invaders & Cur-Ball). One example is Age Invaders, which was designed with a user-centred approach and an ability to adapt the system for a variety of age groups so as to mitigate certain disadvantages experienced by older players (such as slower reaction time for older adults) (Khoo et al., 2008). Thus, it was specifically designed to incorporate an intergenerational aspect to gameplay so everyone can play (Khoo et al., 2008). However, existing games have also shown to be an environment where intergenerational communication and entertainment are possible (Vioda & Greenberg, 2012). Vioda & Greenberg (2009) found that console games were often used as a “computational meeting place”, that allowed for diversity in many areas including age. They suggest that digital games can be used as a bridge between the generations. Within the study, they found participants played with up to four generations of gamers. Each generation seemed to take on its own role, bringing something different to the experience. Inter-generational gameplay can be seen in the high amount of Canadian parents (59%) who play digital games with their children at least once a month (ESA Canada, 2012). Playing games can also begin, or become a part of interactions, with grandchildren (Quandt, Grueninger & Wimmer, 2008). As there is a distinct benefit to the possibility for games to increase interactions between different age groups, this may be useful in future research as intergenerational relationships can help individuals in a variety of ways mentioned above.

Psychological

Various studies have also found that digital games may be useful for psychological reasons (Mcguire, 1984; Jung et al., 2009; Wollersheim et al., 2010). The simple engagement of play within itself may contribute to well-being (Goldstein et al., 1997). An early study conducted by Mcguire (1984) gave one group of older adults' access to video gameplay while the other group did not get this. He found that the group that used video games had significant improvements in well-being, self-esteem and affect over the 8 week period. A more recent study by Jung et al. (2009) of older adults (aged 56-92) in a long-term care facility who participated in a field experiment, in which they played Wii for 6

weeks, found that it improved the psychological well-being of the individuals within the study compared to a control group. Wollersheim et al. (2010) also found that many older women in their study felt less marginalized after playing a Wii game.

Some older adult players also use games as a form of escape and distraction from life difficulties and loss (Nap et al., 2009). For example, in a study by Nap et al. (2009) they describe a woman that used digital games as a way to escape the sorrow of losing her husband. They noted that while she was playing she was smiling and having fun, but the moment she had finished, she immediately returned to talking about her loss.

Digital games may have a therapeutic effect by allowing individuals to step back from their life and to explore ideas through the safety of virtual reality (Gamberini et al., 2008). Russoniello, O'Brien, & Parks (2009) found that casual video game use actually created some physiological changes in the body which reduced stress, this in turn may help to alleviate stress related disorders including depression. A study by Rosenberg et al. (2010) used Wii exergames for older adults with subsyndromal depression with the preliminary results showing improvements in the participants. Some specific games have been designed for psychological purposes, such as SPARX which has demonstrated some success in treating depression (Merry et al., 2012).

Digital games have specifically been utilized for their ability to distract individuals from their sorrows, help them cope with sadness, or from illness (Gamberini et al., 2008). In cases where chronic disorders or painful treatments are needed, games have the potential for providing a level of psychological or social relief (Gamberini et al., 2008). A study by Schneider et al. (2003) using games to help breast cancer patients through chemotherapy reported that the older women in the study (84%) found digital games useful as a distraction and as a way to reduce stress.

2.4.4. Cognitive

As discussed previously, one of the important factors associated with successful aging in older adults is cognitive health. It is generally accepted that aging also includes a decline in many cognitive processes, but the extent to which this occurs and whether it can be slowed, or even reversed, has become of interest to researchers and scientists.

Among other mechanisms, cognitive decline can be marked by a slowing of chemical reactions and neural connections (Yankner, Lu, & Loerch, 2008). With an increase in our understanding of cognition and aging, science now sees cognition as not being fixed, but dynamic and plastic in nature (Bishop, Lu, & Yankner, 2010). Brain plasticity is the brain's ability to change and reorganize neural networks. It is the foundation of our ability to learn and adapt, and in turn survive. This is how individuals are able to learn and change ideas and understanding. As individuals age, neural plasticity declines; however, it does not disappear completely. A recent study suggests there may be more plasticity than previously thought (Kramer, Bherer, Colcombe, Dong, & Greenough, 2004). The ability for the brain to adapt and reshape thoughts is crucial for coping with the changes that occur in life and aging (Gamberini et al., 2006). Thus, it is important for successful aging.

There are two different distinctions within cognitive processing: crystallized abilities (such as knowledge based) and fluid based (such as processing) (Kramer et al., 2004). The crystallized abilities tend to have little decline over the lifespan, and even improve; however, it is the fluid abilities that seem to suffer the most from aging (Kramer et al., 2004). It is suggested that age causes the greatest impairment to those abilities associated with executive control processes or cognitive control as these have to be constantly monitored and maintained, due to the many changes that occur within the brain so as to adapt to everyday life (Basak, Boot, Voss, & Kramer, 2008). There are many areas in the fluid abilities that cognitive processing has distinct declines, such as in spatial memory (Burke & Barnes, 2006). However, not all processes and related cognitive abilities that decline with age do so at the same rate or the same time (Kramer et al., 2004). Furthermore, changes within the brain that occur with aging can cause a number of dysfunctions within attention, perception, and memory (Mahncke et al., 2006).

As mentioned, cognitive decline is not set at a certain rate or speed, and various research has been exploring the possibility of specific life factors that may prevent cognitive decline and possible interventions that may stop or improve cognition (Mahncke et al., 2006; Wang et al., 2006; Hedden & Gabrieli, 2004). There has been some evidence to suggest that physical exercise and simply keeping the brain active may slow down this process (Matsou et al., 2003). With this in mind, some studies have also found that some leisure activities could reduce the risk of cognitive decline (Kramer et al., 2004; Wang et al., 2006). A study by Wang et al. (2006) found that playing board games (most

respondents played Mahjong) could reduce risk factors for cognitive impairment in older adults, while television increased the risk. Thus, this study showed two important points; firstly, that leisure activities can have an impact on cognitive decline; and secondly, that games may be a leisure activity that may help reduce cognitive impairment.

The idea that certain leisure activities and behaviours are cognitively stimulating has created an interest and production of brain training programs (e.g. ACTIVE, Lumosity). With these types of programs, there have been numerous studies on brain training in older adults with many successful outcomes (Mahnke et al., 2006; Willis et al., 2006; Ball et al., 2002). One study by the USA National Institute of Health designed a project called ACTIVE which aimed at testing cognitive training for older adults. They found that when the participants were trained in separate skills (memory, attention, problem solving) they improved in those specific skills, but there was no transfer to the other two untrained areas (Ball et al., 2002). While a study by Mahnke et al. (2006) found that a brain plasticity training program was effective in improving a more general cognition.

More recently there has been a focus on using digital games to improve different aspects of cognition in older adults. Even big computer game companies have brought out games, such as Brain age by Nintendo, which are meant to enhance cognition. Games have often fallen within this category and have been incorporated into many recent designs. Specific game-based projects, designed to enhance cognitive function and attempt to overcome some of the difficulties that arise with aging, have also been on the increase as many researchers attempt to assess the impact of games upon cognition (e.g. Eldergames, 2006; HERMES, 2009; SilverPromenade, 2011).

Digital games within themselves would not be as interesting, nor sustain our attention for as long, if we did not have the capacity to improve with each go and overcome our challenges (Lynch, Aughwane, & Hammond, 2010). As noted earlier, challenge was one of the main motives that older adults had for playing digital games. Thus, digital games and cognition are deeply intertwined and connected together (Gamberini et al., 2008). There seems to be little doubt that many computer games provide mental stimulation; however, further investigation is needed regarding transferability, sustained benefits, and to better understand which cognitive processes are being activated during gameplay.

Some studies have compared regular gamers to non-gamers and suggest that certain cognitive processing appear to be more enhanced (Basak et al., 2008; Boot et al., 2006).

Various studies have found digital games to be useful in stimulating cognition (Chuang & Chen, 2009; Basak et al., 2008; Boot et al., 2006). Digital games require a certain amount of perceptual learning. Although the ability of perceptual learning involves varying cognitive skills, many of them have been thought to only be specific to the current task (such as attentional weighting). However, recent studies in digital games and cognition have found that the general cognitive skills can sometimes be enhanced by gameplay (Lynch et al., 2010). For example, a recent review of research that looked into surgical ability and playing digital games has found a correlation in some skills (Lynch et al., 2010). Spence & Feng (2010) suggest the most prominent cognitive skills used in many digital games were related to spatial cognition. This skill includes a variety of underlying cognitive aspects that allow for the overall ability. Many studies have looked at specific cognitive aspects in relation to gameplay, although it should be noted that there are likely to be multiple processes occurring at the same time. Different games may also increase the use of different cognitive skills. Spence & Feng (2010) theorized cognitive skills that may be used with different game types, as outlined in their table (See Figure 1).

Figure 1. Possible Cognitive Skills with Different Game Types

Table 1
Sensory, Perceptual, and Cognitive Functions Exercised by Different Genres of Video Games

Function	Game characteristic	Action	Driving	Maze/puzzle
Sensory				
Detection	Complex 3-D setting, targets in clutter	■■■■■	■■■■	■■
Attention				
Capture	Abrupt-onset events	■■■■■	■■■■	■■
Select	Discriminate/select significant objects	■■■■■	■■	■
Switch	Task switching, multitasking	■■■■■	■■■■	■
Divide	Multiple foci, track multiple objects	■■■■■	■■■■	■■
Distribute	Peripheral events	■■■■■	■■■	■
Visuomotor				
Coordination	Aiming, shooting, operating hardware	■■■■■	■■■	■
Speed	Rapid action/reaction	■■■■■	■■■■■	■
Memory				
Working	Allocate resources, make decisions	■■■■■	■■■■	■■
Long term	Integrate knowledge	■■	■	■■■
Cognition				
Spatial	Mental rotation, wayfinding, navigation	■■■■■	■■	■■■
Analytical	Solve puzzles, devise strategies	■■	■■	■■■■
Auditory	Speech, game sounds, music	■■■	■■	■
Emotional	Arousal (threat)	■■■■■	■■■■	■

Note. Importance: ■■■■■ = very high; ■■■■ = high; ■■■ = medium; ■■ = low; ■ = very low.

Note. Table from Spence & Feng (2010, p.93)

Digital games have the ability to stimulate many cognitive processes at once (Basak et al., 2008). However, for the sake of discussion and the current research, five varying cognitive areas that have had attention by researchers of digital games and older adults will be considered: reaction time, attention, memory, problem solving and reasoning. Although this is not an exhaustive list, and they entail a number of cognitive tasks within, for the purposes of this study these categories are useful.

Reaction Time

One cognitive/physical skill that has received considerable attention, within research on digital games and older adults, is reaction time. This was of particular interest to original research on “first generation games” and research on using these with older adults. First generation games often consisted of mainly pure ludic style games, such as Tetris and Pac Man. The early studies into older adults and digital games found reaction time to be one of the main benefits (e.g. Dustman et al., 1992; Clark et al., 1987). Dustman et al. (1992) found that adults between the ages of 60-79 had faster reaction times after playing a video game for 3 hours per week for 11 weeks than those that did not (in Goldstein et al., 1997). Clark et al. (1987) performed one of the original studies on older adults and computer games with one of the main purposes being to test reaction time improvements. The two games chosen were Donkey Kong & Pac Man. It was found that the older adults who played the video games had an increase in reaction time compared to the control group (in Goldstein et al., 1997). Another study by Goldstein et al. (1997) found that older adults trained on Tetris for 25 hours had better scores than the non-gamers on the Sternberg test, which is used to examine reaction times. Finally, although somewhat related to attention, a more recent study by Castel, Pratt, & Drummond (2005) found that video game players had a faster reaction time when detecting visual stimuli, and their response time for both easy and hard search tasks was faster than the non-video game players. They propose that the results may suggest that video game players have faster stimulus-response mapping on visual tasks.

Attention

Although there are a variety of attention related cognitive abilities that may be improved by digital gameplay, some studies have specifically focused on improvements to visual attention (Green & Bavelier, 2006). Attention is a multidimensional construct

which includes a variety of cognitive processes (Gamberini et al., 2006). A certain level of attention is required for other cognitive functions, such as problem solving. Numerous studies have looked at the effect that digital gameplay has on attention (Boot et al., 2008; Chisholm, Hickey, Theeuwes, & Kingstone, 2010; Green & Bavelier, 2003; Whitlock et al., 2012).

The type of game has often been important on studies of attention related tasks. Chisholm et al. (2010) specifically studied action games as playing these games would theoretically enhance attentional capture more than other types of games. They found that action video gamers compared to non-action gamers had better response time for objects that were in isolation or with a distractor present. They suggest that action video games enhance a player's top-down attentional control. Furthermore, in a series of studies led by Green & Bavelier (2003; 2006), it was found that playing an action video game (Medal of Honor) improved the performance on a number of attentional and perceptual activities, including increased visual selective attention. The initial study by Green & Bavelier (2003, 2006) found that video game players had developed more attentional resources which allowed them to spread their attention over a longer period of time and space. In a further study, the same researchers found that processing of spatial resolution was also enhanced within action gamers (Green & Bavelier, 2007). Interestingly, within the study by Green & Bavelier (2003) individuals only needed a short amount of time playing to increase the cognitive benefits whereas Boot et al. (2008) found that 21 hours of training was not enough to give them the cognitive advantage of gamers. Although, Boot et al. (2008) did not find the same amount of advantages overall, they outlined possible methodological reasons for this. Another interesting finding that occurred through playing of action video games was in a study by Feng, Spence, & Pratt (2007) where they found a gender difference in spatial attention, with females being significantly weaker. However, when they were trained with an action video game both males and females improved with the females catching up to the males in ability (Feng, Spence, & Pratt, 2007).

Some studies have found that using digital games that demand a high level of attention, such as *World of Warcraft* and *Rise of Nations*, have improved cognitive function in older adults (Basak et al., 2008; Whitlock et al., 2012). Whitlock et al. (2012) found that *World of Warcraft*, chosen because it demands a high level of attention, was found to improve cognitive function in a group of older adults. Interestingly, they found that age was

not a factor for cognitive change in the participants. This was unexpected since theoretically brain plasticity is thought to decrease with age. It was also found that lower ability adults had the greatest benefits from the game (Whitlock et al., 2012).

Memory

Many older adults are concerned with the decline of memory in later years (Mol et al., 2007; Reese, Cherry, Norris, 1999). Memory has been a targeted cognitive process in brain training programs for older adults (Verghese et al., 2003). Two main memory processes that are often discussed are working and long-term memory. Working memory, sometimes called short-term memory, is a storage workspace where information is temporarily stored for processing. It includes the central executive, and two storage systems: the phonological loop and the visuo-spatial sketchpad (Baddeley, 2003). Long-term memory stores information after it has been filtered and processed and can be accessed at a later date.

Numerous studies have attempted to look at digital games in relation to memory (Boot et al., 2008; Basak et al., 2008; Chuang & Chen, 2009). A study by Chuang & Chen, (2009) found that video game training improved fact differentiation and recall processes in children. In relation to adult participants, Boot et al. (2008) found that short-term visual memory was much better in expert gamers than none gamers. Of the studies that have tested memory for older adults who play digital games, there seems to be mixed results. One study by Basak et al. (2008) found that the use of video games to improve memory was somewhat effective for working memory and visual short-term memory. Although there seem to be very few studies that have associated an increase of memory with games, it is still an important area to consider since cognitive activities may help reduce the risk of cognitive impairment, including memory (Verghese et al., 2003).

Problem Solving/Reasoning

The ability of digital games to enhance problem solving and reasoning has been the topic of many arguments for games in education (Gee, 2003; Squire, 2008). Many games, whether digital or not, within themselves are designed so as to require the individual to solve some sort of a problem or overcome a certain task. It is the combination of the games ability to let the player fail and try again which allows them to reconsider a

problem over again. Another important aspect of problem solving and reasoning, in regards to cognition, is that it has the ability to cross many domains (Hung & Van Eck, 2010). The ACTIVE study found that when participants were trained in reasoning skills these transferred over into everyday life; whereas memory and processing speed did not (Willis et al., 2006).

There have been a few studies that have looked at problem solving ability and reasoning in relation to digital game use (Chuang & Chen, 2009; Steinkuehler & Duncan, 2008; Van Muijden, Band, & Hommel, 2012). One study involving children in a learning environment found that digital games improved participants' problem solving skills (Chuang & Chen, 2009). A study by Steinkuehler & Duncan (2008) coded 1,984 online forum posts from a large MMORPG game forum (World of Warcraft) for evidence of scientific habits of mind. They found that over half of the posts exhibited systems based reasoning, 10% showed modeled based reasoning, while 65% evaluate epistemology. It was concluded that the posts showed a certain amount of reasoning, and that the interactions between the forum participants were mainly of a social knowledge construction. Knowledge construction is often a key goal of many educational forums, so to find this within game forums is promising for learning. The authors of the forum posts were anonymous so age could not be determined. However, in regards to older adults, a recent study by Van Muijden et al., (2012) used 54 older adults (aged 60-77) who played cognitive training games, for 30 minutes a day, for seven weeks, and then were compared to a group of 20 older adults who watched a documentary and answered questions about them. Although the results were very moderate in regards to cognition and transfer in many of the categories, inductive reasoning showed up as a larger improvement for the game players compared to the documentary group.

All of these studies are promising in regards to cognitive improvements in older adults who use computer games. However, the extent to which individuals feel that the games improve their cognition still lacks exploration within the research. As mentioned earlier, many older adults find that the challenge of games is appealing, while others mentioned they feel it keeps their brain active. As many scientists have also linked a slowing of mental decline with physical exercise the new area that has also come into play with older adults, games, and quality of life is that of physical activity through exergames.

2.4.5. Physical

Although it is out of the scope of this thesis to explore computer games in relation to physical health, it is worth noting since there has been a particular focus, in current research, using exergames with older adults to promote physical activity. The successes and failures of this research are worth considering as physical health is one of the major criteria of quality of life, and the potential for using exergames has been considered in numerous studies. It has also been noted that physical activity can also help to protect cognitive and psychological health (Kramer & Erickson, 2007). The combined potential of games to be used for both stimulating physical and cognitive functions has gained increasing attention with many studies showing promising results (Maillot et al., 2012; Anderson-Hanley et al., 2012).

Exergames, such as Wii Fit, have been used to demonstrate the benefits of games for improving balance in older adults (Peng et al., 2011; Agmon, Perry, Phelan, Demiris, & Nguyen, 2011; Heick et al., 2012). These types of games may also help with such areas as rehabilitation and prevention (Wiemeyer & Kliem, 2012; Heick et al., 2012). Furthermore; exergame use for older adults has also included whether it would affect their psychological health as well as physical health (Wollersheim et al., 2010; Rosenberg et al., 2010). Within these there may also be some difficulties, such as different problems of movement that can affect gameplay. These have been the subject of many recent games designed specifically for older adults (Gerling et al., 2010).

2.4.6. Areas for Investigation

Digital games have been increasing in popularity, and have maintained the interest of many researchers and designers in regards to their use for older adults. To date there have been limited studies that have focused specifically on older adult gamers, their perceptions of the games, and their opinions regarding the effects of gameplay on their lives. Particularly, there have been very few investigations that consider how older adults perceive the influence of digital games on many of the areas that have been discussed as contributing to successful aging and quality of life. Some of these factors being physical, cognitive, psychosocial, learning, and leisure. If games are to be of use, it may be of

benefit to determine if players perceive them as useful leisure activities in regards to these areas.

Digital game implementation has shown to have some positive effects on the well-being of the elderly population (Rosenberg et al., 2010). Much this research has focused on programs where games have been implemented to determine whether there are causal effects. In light of many of the different effects of games, such as the possible cognitive benefits of action games and the social & intergenerational possibility of MMORPGs, it is worth exploring whether older adult gamers find that they feel that these benefits occur. Determining whether individuals who play specific styles of games can be interesting to see whether certain games appear to the respondents as more beneficial for selective areas. Digital games may also be a medium to which the older population, who have not yet embraced technology (the no-nets), may use self-directed learning to improve computer and Internet skills. With this in mind, it is worth exploring whether current digital gamers perceive improvements in computer skills through their interactions and experiences with digital games.

With numerous possibilities for the use of games as leisure activities, for therapy, and as learning tools, it is important to determine the opinions and experiences of current players as their understanding may be a valuable source for future research. As others have noted, there is an “urgent need for research on older computer gamers” (Quandt et al., 2009, p. 29). There seems to still be a large amount of research needed to determine the true benefits that play, and particularly digital play, can afford an aging society. This study aims at helping future researchers understand how older adults perceive their experiences with digital games with regard to quality of life. The current survey was designed with the specific purpose of exploring these relationships.

3. Methodology

This study is a cross-sectional survey of the opinions and experiences of older adults who play digital games. It examined a variety of information including characteristics, experiences, patterns of use, and opinions of digital games among older adults.

3.1. Respondents

The population targeted was older adults who play digital games. Older adults are defined within this study as individuals age 55 and above. The age that individuals begin to be considered an older adult, often termed “seniors”, ranges from 50-65. The age of 55 was chosen for a variety of reasons with consideration to previous work looking at older adults and video games; for example, this is the start of the oldest age group within the Entertainment Software Association of Canada. Originally, the study sample involved older adults who met more restrictive criteria of being retired. The original reason for this criteria restriction was that after individuals retire from work they may have more time on their hands, may be more prone to feeling socially isolated, and may not have as much cognitive stimulation as those that are still employed. However, it may also be important to include both those who have and haven’t retired since many people work part time, or voluntary jobs after retirement. Also a non-retired older adult group added an interesting comparative group.

The study aimed to have a minimum sample size of 50 respondents. The group consisted of individuals who may play a large variety of digital games, including online and offline games. To be included in the study respondents had to have played digital games at some point within the last year.

3.2. Research Instrument

This study used a web-based quantitative questionnaire that consisted of questions that asked older adult gamers about their demographics/characteristics, patterns of use, opinions, and experiences (Appendix B). Most questions were closed-ended, with a small number of open-ended questions to get a better understanding of certain aspects that will help to inform future research (such as what games they play). The survey asked about background information, digital game playing patterns and experiences, and opinions regarding social, psychological, cognitive and educational aspects. The web-based questionnaire was administered to the respondents through Fluidsurveys.com, which has servers that are housed in Canada. Before making the survey live, a few pilot cases were conducted either with paper and pen or online, it was estimated that the survey would take respondents approximately 15 minutes to complete.

Table 1. Questions and Related Research

Type of Questions	Sources Designed From
Background Information	Questions were influenced generic survey questions.
Patterns of Use	Pew, Video Games: Adults are Players Too (2008)
Playing with others	Pew (2008) – Teens, Video Games and Civics
Social/Psychological	Eldergames (2006), Wollersheim et al. (2010), Khoo & Cheok (2008), Jung et al. (2009), De Schutter (2011)
Cognitive	Gamberini et al. (2006), Buiza et al. (2009), Gamberini et al. (2008), Wollersheim et al. (2010)
Educational/Skills	Gamberini et al. (2008), Wollersheim et al. (2010)

Questions were developed from previous surveys, standards, or scholarly research and discussions. Table 1 outlines questions that have been informed by prior work. A first draft of the survey was written up and then taken to the “Aging Well, Can Digital Games Help?” research group and edited and altered to make a better questionnaire and meet requirements outside this thesis, as this questionnaire will be used

as part of a larger study. However, it was decided that the survey for this thesis should match the other study for future comparisons. For that reason there is one section within the study where data was collected but was not used for this thesis (Questions 1-7).

3.3. Methods of Recruitment and Data Collection

Recruitment occurred mainly through online websites. A number of game and seniors websites were targeted (see Table 2 for websites). For websites that require registration, permission was requested to post a message with a link to the survey on the forum/website. The web-based questionnaire was administered to respondents through the survey tool *Fluidsurveys.com*. Since one portion of the demographic group targeted were individuals that play digital games online, it was appropriate and important to recruit online. The other portion comprised of individuals that may play more solitary games. These individuals were also recruited from online sites, such as AARP, and one community group offered to help with recruitment by sending an email to older adults in their community who are known to be computer users.

To increase the chance of respondents completing the questionnaire, respondents were entered into a draw for three chances to win \$50 upon completion. To ensure privacy a separate link appeared at the end of the survey to take respondents to a separate website. This allowed respondents to fill in their contact information and maintain the anonymity of their survey responses. After the draw was completed all information pertaining to the individual's identity will be deleted.

The procedure for taking the survey was as follows. Individuals read the recruitment letter and clicked on the link to *Fluidsurveys.com* if they wished to participate. If they chose not to participate then they didn't click the link and they exited the forum page as usual. If they decided to click on the link it brought the participant to the first page, which is the consent form (Appendix A). Individuals had two options: they could agree to the consent form, which took them to the survey questions, or they could choose the not agree option and exit *Fluidsurveys*. If a respondent agreed to take the survey it took them immediately to the first question. At the end of the survey, respondents had two choices; they could either submit and exit the system, or submit and enter the draw. If they choose

to enter the draw it took them to a separate survey page (through SFU) that asks them for their name, address, email address, and phone number.

Table 2. Websites for Recruiting Respondents

Name of Website	URL	Focus
Seniors Living	http://www.seniorlivingmag.com/	“Senior Living is a media house with several media formats from which to choose”
Wired Seniors	http://www.wiredseniors.com/	“A Portal Web Site To Serve All The Needs Of The Over 50 Age Group”
AARP	http://www.aarp.org/ Also put on their Facebook page by the state director for AARP (Illinois)	Senior online community with forums and information. “AARP is dedicated to enhancing quality of life for all as we age.”
The Wine Conspiracy	http://www.guildportal.com/Guild.aspx?GuildID=324992&TableID=2724542	A gaming forum group mainly centered on a guild.
The Older Gamers	http://www.theoldergamers.com/	A place for older gamers (wide range of ages), form guilds in games, provide a forum space for discussions.
Games for Change	http://www.gamesforchange.org/	A games site that looks at educational games. There is a Gmail group that it was sent out to
Konegrate	http://www.kongregate.com/	Game site
Silver Harbour Centre	Sent by email	Sent by email, assisted in recruitment

Once approval was obtained, it took approximately 2 months to gather all of the data. The first couple of weeks consisted of gaining access to the different websites and ensuring that appropriate permissions were gained from moderators. The link to the survey was then posted onto the websites with a request that all respondents complete it within two weeks of posting. The final weeks were used to encourage a higher response rate and other websites contacted to get further respondents.

In regards to research ethics involving human respondents, no information was withheld from respondents. Also, the study was completely anonymous so the identity of

individuals and their information was protected. There were no risks to respondents in completing the survey.

Methods for Maintaining Confidentiality

Confidentiality was protected and maintained through a variety of ways. First, all survey information was stored on Fluidsurveys. Fluidsurveys is housed in Canada so confidentiality can be guaranteed. Also the identity of the respondents was not linked to the surveys. The only document that we recorded participant details for was the cash draw, which was maintained on the SFU server through an SFU websurvey. Once the cash draw was completed, all documents with the individual's names were deleted. Other files will be kept for two years.

A separate database without respondent identities was created and analyzed and this information was stored on a USB device that is kept in a locked cabinet in the office of Dr. David Kaufman. Data will be stored for a period of 2 years.

3.4. Data Analysis

Firstly, the surveys were downloaded from Fluidsurveys.com into an Excel spreadsheet. Only individuals who had stated that they had played digital games in the last year were included in this study. Since players did not have to answer every question, variables linked to these non-mandatory questions contained slight differences in the amount of respondents who answered them, and thus although n=50 respondents took the survey there may be some variation. The information was cleaned and marked for missing data. Missing data was coded as 99 and marked as a discreet missing value so as to only calculate for those who had filled in the question. Thus, percentages are based on those numbers of people who answered the questions. Once this was completed in Excel, the data was put into spss19 and another cleanup was done to identify any errors.

The survey was analyzed using SPSS19 and descriptive statistics were calculated for various questions, personal characteristics, patterns of use, and opinions. Each variable was calculated for its frequencies, including both the number and percentage of all who had answered the question. Also, cross-tabulations were conducted to find

relationships between specific variables. Specific characteristics (sex, education, retirement, skill in gameplay, skill in computers), patterns of use (hours played per day, number of days each week), and whether they played with others (MMORPG's, social games, and had met new people online) were cross-tabulated with opinions of psychosocial aspects, cognitive aspects, and learning aspects.

Chi-square tests were calculated for statistical significance. The inclusion criteria for significance was set at $p=.05$ and were reported as: *significant at the .05 level, **significant at the .01 level, ***significant at the .001 level.

4. Results

Due to the nature of the research questions, the first part of the survey on games and leisure activities was not included in this study. This part was added to compare later with another study (see Kaufman, 2013), but was not relevant to the focus of this thesis.

In total, 50 respondents completed the survey; however, not all respondents answered every question. For example, the characteristics questions were placed at the end of the survey and a few respondents did not answer these. Frequencies and cross-tabulations are used to answer the research questions. The results are organized into tables with a brief discussion of the findings (further investigations in Chapter 5).

The five research questions examined were:

1. What are the characteristics of older adults who play digital games?
2. What are the patterns of use of older adults who play digital games?
3. What types of games do older adults play? Do they play with others?
4. What are the opinions of older adult gamers on the benefits and difficulties of playing digital games?
5. What are the relationships among older adults' characteristics, patterns of use and play with others with their opinions of the benefits of digital games?

4.1. What are the characteristics of older adults who play digital games?

4.1.1. Characteristics

Tables 3, 4, and 5 show the frequencies for answers on questions about respondent characteristics. The respondents of this study were older adults aged 55+; however, most of those who participated in the survey were mainly the young-old (third age category), with most being aged 55-60 (see Table 3). Almost all respondents had a primary language of English, and all of the respondents were Caucasian. The three main countries that the respondents were from Canada, USA, and Australia.

Table 3. Characteristics of Older Adults who Play Digital Games

Characteristics	Category	Frequency (n)	Percent (%)
Sex	Female	25	56.8
	Male	19	43.2
	Total	44	100.0
Age	55-59	21	46.6
	60-64	12	26.7
	65-69	5	11.1
	70-74	3	6.7
	75-79	3	6.7
	80-89	1	2.2
	Total	45	100.0
Language	English	43	97.7
	Other (Spanish)	1	2.3
	Total	44	100.0
Country of Residence	Australia	10	22.2
	Canada	16	35.5
	Scotland	1	2.2
	South Africa	1	2.2
	UK	2	4.4
	USA	16	35.5
	Total	45	100.0
Ethnic Group	Caucasian	45	100.0

Table 3 shows the frequencies for basic information such as sex, age, language, country of residence, and ethnic group. Many of the characteristics of respondents were similar to previous studies on older adults who play digital games, such as the proportion of males to females. Of the 44 that answered the question of sex, 25 (56.8%) were female and 19 (43.2%) male (Table 3). As noted in previous studies (e.g. Pearce, 2008; De Schutter, 2011; Shultheiss, 2012), there are a slightly higher amount of women players compared to men. Overall, there has been an increase in women players of all ages over the last 10 years, with recent statistics showing that almost half of gamers are female (ESA, 2013). However, in regards to older adults, women tend to slightly outnumber men,

as is seen in this study. Older women tend to be the main users of casual games and the finding that women outnumber men may be due to the increase in access to casual games through numerous devices (Kafai, Heeter, Denner, & Sun, 2008). It has been suggested that the reason casual games are appealing to older women is because they allow players to play for short periods of time in-between tasks (Kafai et al., 2008). However, although this may have been the original reason to start playing, it has been found that gamers who play casual games do not necessarily have short sessions (Kafai et al., 2008).

Almost half of the respondents were within the age group of 55-59 and almost three quarters (73.3%) were under 65 years, leaving only 26.7% above 65 (Table 3). This suggests that this study was mainly representative of the younger older adult age group. There was at least one participant in each age group, with the eldest being in the 80-89 age group. Almost all respondents' main language was English except for one who spoke Spanish. The respondents came from a range of countries; however, most were from three countries: 35.5% from Canada, 35.5% from USA and 22.2% from Australia. All of the respondents were Caucasian (Table 3).

Table 4 reports characteristics such as living arrangement, education, and working situation. All of the respondents lived at home versus other accommodation such as a retirement village. Living arrangements varied with 56.8% living in a couple, 27.3% lived with family and 11.4% lived alone (Table 4). Older adults within a couple or living with family are often less likely to be lonely (Victor, Scambler, Bond, & Bowling, 2000). Within the current study, many of the respondents either lived as a couple or with family. This may have an impact on whether or not the respondents felt that playing digital games helped them deal with feelings of loneliness, which was reported as being increased by only a small number of respondents (see Table 11).

All of the respondents had a high school degree or higher (Table 4). Almost half of the respondents had a four year degree or above. Similar to previous studies on digital gamers (De Schutter, 2011; Pearce, 2008), the respondents were well educated, with many having a degree and all being high school graduates. Education background has also been predictive of computer use in general (Selwyn, Gorard, Furlong, & Madden, 2003). Since the PC is the main source of game access reported in this study (see Table 7), the relationship may be related to general computer use as well as game use.

Table 4. Characteristics of Living Arrangement, Education, and Work

Characteristics	Categories	Frequency (n)	Percent (%)
Housing	At Home	45	100.0
Living Arrangement	Alone	5	11.4
	In a Couple	25	56.8
	Others	2	4.5
	With Family	12	27.3
	Total	44	100.0
Education	Less than High School	0	0
	High School or Equivalent	5	11.1
	Some College/CEGEP	12	26.6
	2-Year Degree	8	17.8
	4-Year Degree	9	20.0
	Master's Degree	3	6.7
	Professional Designation	3	6.7
	Doctoral Degree	5	11.1
	Total	45	100.0
Retired	No	27	60.0
	Yes	18	40.0
	Total	45	100.0
Working Situation (Paid or Voluntary)	Not Working	13	28.9
	Working Full-time	20	44.4
	Working Part-time	12	26.7
	Total	45	100.0

There were 40% who were retired, and 60% who were not (Table 4). This may be related to the younger age of the older adult respondents. However, this split still allowed for a good comparison between retired and non-retired respondents. In regards to working (whether for money or voluntary) 44.4% worked full-time, 26.7% part-time, and only 28.9% did not work (Table 4).

Table 5. Skill in Digital Games and Computers

Skill	Categories	Frequency (n)	Percent (%)
Digital Games	Expert	14	28.6
	Intermediate	28	57.1
	Beginner	7	14.3
	Total	49	100.0
Computers	Expert	17	34.7
	Intermediate	28	57.1
	Beginner	4	8.2
	Total	49	100.0

Table 5 shows respondents skill in playing digital games and computers. Over half of the respondents were in the category of intermediate in both gaming and computer skills. Interestingly, there were only a few respondents who were beginner in their computer skills (8.2%) or digital games skill (14.3%), with around 30% being experts (Table 5). Considering there is often a stereotype of older adults not having very good computer skills this sample seems to suggest otherwise. However, it does suggest that this sample does not have a large representation of beginner players and computer users meaning that it is difficult to determine whether the results would be different for those players who have just begun. It also might suggest that gaming within itself also takes a certain amount of skill to begin with.

4.2. What are the patterns of use of older adults who play digital games?

4.2.1. Patterns of Use

Table 6. Years, Days per Week, and Hours Played

Patterns of Use	Category	Frequency (n)	Percent (%)
Number of years playing digital games	Less than 1 year	3	6.0
	Years Played 1-4 years	6	12.0
	5-9 Years	11	22.0
	10+ Years	30	60.0
	Total	50	100.0
Number of days per week they play digital games	0	1	2.1
	1	1	2.1
	2	5	10.7
	3	4	8.5
	4	3	6.4
	5	8	17.0
	6	8	17.0
	7	17	36.2
	Total	47	100.0
When they play, the number of hours played at one time	1 hr or less	14	30.4
	2-3 hrs	21	45.7
	4-5 hrs	8	17.4
	6-8 hrs	2	4.3
	More than 8 hrs	1	2.2
	Total	46	100.0

Table 6 shows the number of years played, the number of days each week, and the hours per day. Almost two-thirds of the respondents, 30 (60%), have played digital games for 10 years or more (Table 6). This is consistent with the ESA (2012) survey, which reported that the average number of years adult gamers had been playing digital games was 14. Furthermore, only 6% of the respondents began playing digital games

within the last year (Table 6). This may help to account for the low level of respondents claiming to be beginner players (see Table 5).

The number of days per week respondents played over the last month was spread from 0-7 days; however, there is a distinct increase within this sample at about 5-7 days (Table 6). The largest grouping was those that played 7 days per week with 17 (36.2%) claiming to play every day (Table 6). This is akin to the ESA Canada (2012) findings that 32% of older adult gamers play every day. On the other hand, the number of hours played per day had a larger grouping in the less than an hour and 2-3 hours, with 2-3 hours being the highest with 45.7% respondents reporting this behaviour (Table 6). The combination of days played and hours per day, suggest that many of the respondents within this study are likely to be consistent regular players which has been found in many previous studies (Lenhart et al., 2008; ESA Canada, 2012; Delwiche & Henderson, 2013). Furthermore, as these results are self-reports, it should be noted that a previous study by Delwiche & Henderson (2013) found that older adults tend to underestimate the amount they play.

Table 7. Devices Used

Patterns of Use	Category	Frequency (n)	Percent (%)
Devices Used	Console	11	22.0
	Portable Device	2	4.0
	Desktop or Laptop	43	86.0
	Handheld Device	19	38.0
	Digital Game Machine in Casino	4	8.0
	Total Respondents *	50	

*Respondents could choose more than one option and so the total number of responses is greater than the total number of respondents, and the individual percentages add to over 100%

Respondents reported playing on a number of different devices, as can be seen in Table 7. The desktop or laptop was the number one device used with 86% of respondents using one of these (Table 7). These findings are consistent with prior research (ESA Canada, 2012; De Schutter, 2011; Pearce, 2008), in that most of the respondents used a PC to play digital games. The second most used device was handheld devices (38%) and then the console with just under a quarter of participants using these. Handheld devices offer a portable option for gameplay and may provide the benefit of being able to be used

in any place, at any time. The least used devices were portable devices. such as the Nintendo DS.

4.3. What types of games do older adults play? Do they play with others?

4.3.1. Games Played

Table 8 lists the top games played by older adults in the survey. They had an option to list 3 games. Games that were chosen by 3 or more respondents are included in Table 8. As this was an open-ended question some individuals simply wrote card games, various apps, puzzle games, Facebook games; in other words, exact games were not always reported. Within this study the most common game played was World of Warcraft with 13 (26.5%) respondents stating it was one of their top games. Solitaire had the second highest frequency with almost a quarter of respondents choosing it. This may be higher as respondents may mean solitaire when stating “card games” but that is inconclusive.

Table 8. Top 10 Games Played

Game	Frequency (n)	Percent (%)
1. World of Warcraft	13	26.5
2. Solitaire	12	24.5
3. Guild Wars 2	9	20.4
4. Skyrim	5	10.2
5. Eve Online	4	8.2
6. Poker	4	8.2
7. Sudoku	3	6.1
8. Plant versus Zombie	3	6.1
9. Scrabble	3	6.1
10. Star Wars	3	6.1

The top games played by the respondents in this study were either fantasy based MMORPG's (such as World of Warcraft) or casual games (such as solitaire). However, there were many diverse games reported as being played, ranging from sharp shooter like genres, such as Counter Strike: Global Offensive, to Facebook games, such as Candy

Crush. It is not surprising that casual games, such as solitaire, came up as a choice for many respondents since previous studies have found this to be one of the highest categories of games played by this age group (ESA Canada, 2012; De Schutter, 2011). Interestingly, previous studies (ESA Canada, 2012; De Schutter, 2011) found that older adults prefer casual games to other styles and very few play MMORPG's. However, Pearce (2008) found about a third of baby boomers played MMORPG's.

4.3.2. Digital Play with Others

Table 9. Playing with Others

Playing with others	Answer	Frequency (n)	Percent (%)
Played Role-playing games online with others	No	24	48.0
	Yes	26	52.0
	Total	50	100.0
Played Social games online with others	No	22	44.9
	Yes	27	55.1
	Total	49	100.0
Met new people playing online games	No	21	42.0
	Yes	29	58.0
	Total	50	100.0
Digital games played with others	Alone	42	85.7
	With Others in the Room	23	46.9
	With Others Online	33	67.3
	Total Respondents *	49	
Who they play with	Alone	42	85.7
	Family Members	26	53.1
	Friends	26	53.1
	Association	12	24.5
	Other (Guild)	5	10.2
	Total Respondents *	49	

*Respondents could choose more than one option and so the total number of responses is greater than the total number of respondents, and the individual percentages add to over 100%.

Table 9 reports the responses to questions on who older adults play digital games with and whether they play games where others are playing online at the same time. Within this sample, over half of respondents played MMORPG's (see Table 9), particularly titles such as World of Warcraft and Guild Wars (see Table 8). This finding is likely influenced by some of the recruitment websites which included gaming sites; however, it offers a clear picture of this group and how it might compare to those who play more casual style games. The number of respondents who played social games was slightly higher at 55.1% and those that had met new people online while playing games was 58%. Many social games are also casual games, in that they are short digital games that individuals can play with each other, for instance, scrabble. Although older adults are still the least likely to partake in social networking sites, where many of these games can be played, 43-60% of American Internet users above the age of 50 use them (Brenner, 2012). However, older adults don't need to be part of a social network website to participate in these games since many mobile phones, tablets, and other handheld devices have apps that allow them to play with others.

When looking at whether respondents played with others, 85.7% said they played alone, 67.3% with those online and 46.9% with others in the same room (Table 9). The question of whom they played with was at 85.7% played alone, 53.1% played with family, and 53.1% played with friends (Table 9). The fact that over half of respondents reported playing with family and/or friends demonstrates increased opportunities for maintaining or expanding social contacts. However, the question of who they play with had a slight problem, in that "association" was put as an answer yet "guild" was not included. Although five respondents wrote in "guild" under the "other" category, it could be assumed that more would have reported this if it had been an option since MMORPG's are often played with guild members, and a couple of the sites recruited from were guild websites.

Many of the players did not remain solitary, which is divergent from some reports of older adults sometimes preferring and remaining as lone gamers (Nap et al., 2009; De Shutter, 2011). Previous studies have found that older adult gamers tend to be lone players (De Shutter, 2011; Nap et al., 2009). This study expanded on our understanding of gaming with others, in that it found that although most players reported playing alone, many also played with others online (67%), or in the same room (47%) (Table 9). They reported playing with family, friends, and guild/association members

4.4. What are the opinions of older adult gamers on the benefits and difficulties of playing digital games?

4.4.1. Benefits and Difficulties

Table 10. Benefits and Difficulties of Digital Games

Opinion	Categories	Frequency (n)	Percent (%)
Benefits	Mental Exercise	44	88
	Social Interaction	21	42
	Enjoyment	44	88
	Escape from Daily Life	25	50
	Other	6	12
	Total Respondents	50	
Difficulties	See or Hear	1	2
	Too Complicated	1	2
	Controller Use	7	14.3
	Limited Access	0	0
	Other	8	16.3
	None	28	57.1
	Total Respondents	49	

*Respondents could choose more than one option and so the total number of responses is greater than the total number of respondents, and the individual percentages add to over 100%.

Table 10 shows the benefits and difficulties that respondents reported. The top benefits reported for playing digital games were mental exercise and enjoyment with 88% of respondents claiming these as benefits, 50% of respondents considered escape from daily life to be a benefit of digital games, while 42% found it a good source of social interaction (Table 10). The 6 other responses were: fills in time, rest, clears mental blocks, hand/eye coordination, cheap entertainment, mental dexterity/learning.

It is not surprising that, consistent with other studies (see Nap et al., 2009; Wang et al., 2012), the main benefits of playing digital games were mental exercise and enjoyment. As explained earlier these are not necessarily mutually exclusive. It is interesting that half of the respondents also claimed it was a good escape from daily life.

Although escaping from daily life can be an unhealthy practice, in times when individuals are having difficulty coping, such as with illness and associated pain (Schneider et al., 2003), or the death of a loved one (Nap et al., 2009), it might be a welcome reprieve. Just under half of respondents also expressed that social interaction was a benefit. The implications of this will be discussed in Chapter 5.

Very few respondents reported difficulties in playing digital games, with over half claiming no difficulties at all. Of the reasons given, 14% reported controller use as a main difficulty (Table 10). Of the difficulties mentioned in the “other” category, the reasons were a slowing of reflexes/reaction time, they could not out maneuver younger players raised on video games, and keeping the computer up to date to meet game requirements. The other three respondents said “busy on computer”, “only owns games on windows”, “wife hogs tv”.

The finding that over half of respondents reported no difficulties may be influenced by the fact that many of the older adults were of the younger category. Of the difficulties listed, the main difficulty found was controller use. It has previously been suggested that many older adults may begin to have difficulties with the mouse, controller, and other devices since there is a decline in reflexes and movement with age (Ijsselsteijn et al., 2007). Additionally, a few respondents added to the categories provided, commenting that their reflexes were slow and this caused difficulty. One person mentioned reflexes in comparison with younger players who were quicker, and thus it was hard to compete with them. This raises some interesting questions about the role of the older adult in games where they are playing with younger, faster players. These changing roles may be a difficult and/or rewarding transition for players. This is likely not limited to experience of digital games but part of the transition that occurs with aging.

4.4.2. *Opinions of Psychosocial, Cognitive, and Skill*

Tables 11-13 cover the opinions of older adult gamers in regards to psychosocial aspects (Table 11), cognitive aspects (Table 12), and skills (Table 13).

Table 11 shows whether respondents found that digital games increased, decreased, or made no difference towards psychosocial aspects, such as connecting with different people, and some psychological aspects, such as dealing with loneliness.

Table 11. Psychosocial Aspects

Psychosocial Frequencies	Increased	No Difference	Decreased	Total (n)
Developing New Friendships	17 (36.2%)	28 (59.6%)	2 (4.2%)	47 (100%)
Connecting with Current Friends	9 (19.2%)	37 (78.7%)	1 (2.1%)	47 (100%)
Connecting with Family	14 (29.8%)	31 (66%)	2 (4.2%)	47 (100%)
Connecting with Various Age Groups	21 (44.7%)	24 (51.1%)	2 (4.2%)	47 (100%)
Developing Self-confidence	13 (27.1%)	34 (70.8%)	1 (2.1%)	48 (100%)
Dealing with Loneliness	8 (17%)	36 (76.6%)	3 (6.4%)	47 (100%)
Dealing with Depression	7 (14.9%)	37 (78.7%)	3 (6.4%)	47 (100%)

Around one-third (36.2%) of respondents reported developing new friends as increased through playing digital games, connecting with family had 14 (29.8%) respondents report an increase, and developing self-confidence had 13 (27.1%) respondents report an increase (Table 11). Of the categories that relate to connecting to other people, connecting to current friends had the lowest reported increase. This may suggest that the respondents within this study were more likely to connect with new friends, and family through playing digital games than to connect with current friends. Almost one-third of respondents reported developing self-confidence through playing digital games (Table 11). Other studies have found that digital games can increase psychological well-being, including self-esteem, in older adults (Mcguire, 1984; Jung et al., 2009; Wollersheim et al., 2010).

Almost half of respondents reported an increase to connecting with various age groups through playing digital games (Table 11). This was the highest reported increase for the psychosocial aspects. Intergenerational relationships are important as they have been found to have a positive relationship with feelings of well-being (Weintraub & Killian, 2007) and life satisfaction (Meshel & McGlynn, 2004). Furthermore, playing digital games offers an avenue in which older and younger players can interact in a fun environment, and thus provide a bridge between the generations (Volda & Greenberg, 2009).

The more emotional aspects were interesting but difficult to interpret because they are often dependent on the individual situation. For example, a person will not claim it increases their ability to deal with depression if they have not been experiencing depression in the first place. This may account for the low number of respondents reporting an increase in both dealing with depression and loneliness. However, a recent study found depression to be less in regular and casual gamers (Allaire et al., 2013), and this may also be a reason for the low numbers of reporting an increase in dealing with them. Another study suggests that casual digital gameplay can reduce stress related disorders, in which they found specific physiological effects of this occurring during casual gameplay (Russoniello et al., 2009).

Table 12. Cognitive Aspects

Cognitive Frequencies	Increased	No Difference	Decreased	Total (n)
Focusing Attention	29 (59.2%)	20 (40.8%)	0 (0%)	49 (100%)
Memory	24 (49%)	25 (51%)	0 (0%)	49 (100%)
Reasoning	27 (56.3%)	21 (43.8%)	0 (0%)	48 (100%)
Problem Solving	30 (62.5%)	18 (37.5%)	0 (0%)	48 (100%)
Speed in Reacting/ Responding	31 (63.3%)	18 (36.7%)	0 (0%)	49 (100%)

Table 12 looks at whether respondents found digital games led to an increase, decrease, or no difference in different cognitive areas. The opinions on whether they felt there was an increase in cognitive skills seemed to have the largest increase of all of the categories, with a range of 49-63.3% for each of the cognitive areas asked about. Interestingly, none of the respondents reported a decrease in any of the cognitive areas examined, suggesting that individuals do not feel digital games harm their cognitive faculties, even if they don't believe it increases a specific area.

Speed in reacting/responding had the largest number of respondents report an increase 31(63.3%) (Table 12). It is not surprising that speed in reacting/responding came out as having the highest increase reported in the cognitive abilities (although it is also partially a physical response) since this has been one of the earliest researched areas of the possible benefits of digital games for older adults (see research by Dustman et al., 1992; Clark et al., 1987). One possible explanation for this having the highest report is

that speed in reacting is an ability that can be more easily observed by players. If the game requires the player to react with increased speed to get a better score or move through levels, then the game itself helps the player observe this increase by providing feedback.

Focussing attention had 29 (59.2%) respondents report an increase (Table 12). This has been one of the main areas studied for cognitive stimulation (Boot et al., 2008; Chisholm et al., 2010; Green & Bavelier, 2003; Whitlock et al., 2012). The results of this study seem to confirm much of their findings. However, many of the previous studies used specific games that theoretically would require higher levels of attention, such as action video games and some MMORPGs like World of Warcraft. As that is out of the scope of this study further investigations would clarify whether older adults had specific games they felt helped to improve focussing attention.

Problem solving 30(62.5%) and reasoning 27(56.3%) were both reported as increased by over half of respondents (Table 12). This is promising as theoretically many digital games are designed to promote these abilities. The ability of games to promote problem solving and reasoning through the player’s freedom to fail and try again has been one of the arguments for using digital games for learning and education (Gee, 2003; Squire, 2008). The fact that over half of participants found these cognitive abilities improved is important, not only for cognitive stimulation, but for the possibility of using games in learning programs for older adults.

The only cognitive aspect below 50% was memory 24(49%) (Table 12). It had the least amount of respondents claiming an increase compared to the other cognitive aspects in this study. This is consistent with previous research on memory, which has often had mixed results (Basak et al., 2008). However, an increase in memory was still reported by almost half of respondents.

Table 13. Skills

Skill Frequency	Increased	No difference	Decreased	Total (n)
Computer Skills	23 (46.9%)	26 (53.1%)	0 (0%)	49 (100%)
Internet Skills	21 (43.8%)	27 (56.3%)	0 (0%)	48 (100%)
Digital Game Playing Skills	39 (81.3%)	9 (18.8%)	0 (0%)	48 (100%)

Table 13 shows whether respondents felt that there was an increase in their computer, Internet and gaming skills. Of the respondents who answered the question, 39 (81.3%) reported an increase in digital game-playing skills, 23 (46.9%) reported an increase in computer skills, while 21 (43.8%) reported an increase in Internet skills.

Almost half of respondents reported an increase in computer and Internet skills through playing digital games (Table 13). This is important for programs that may want to help older adults to increase their technology skills. It was expected that respondents would claim that they have improved their game playing skills through the act of playing the games; this assumption was supported, as most players reported an increase.

As noted previously, an increase in computer and Internet skills may be important for older adults, not simply for gameplay, but to allow for a possible increase in access to health information and other support available. It has been noted that an important part of the uptake of IT skills relates to computer engagement and informal learning (Selwyn, 2005). Thus, digital games may be an informal way to increase computer and Internet skills in older adults. For example, a previous study by Wang et al. (2011) found that 95% of the respondents in their survey reported that digital games increased their computer/Internet skills in some way. Although this study did not find quite as robust a finding, the results are still promising. These findings suggest that digital games may be a useful way to educate older adults in either game content, or they may help to increase Internet and computer skills.

4.5. What are the relationships among certain older adults' characteristics, patterns of use, and play with others with their opinions of digital games?

Cross-tabulations were calculated to examine the relationship between different variables, such as specific patterns of use (days per week played and number of hours per session), games played with others (MMORPGs, social games, and whether they met new people playing games online) and characteristics (sex, retirement status, education, digital game skill, computer skill) with respondents opinions of whether digital games increased, decreased or, made no difference to psychosocial, cognitive, and skill aspects. Since all

of the psychosocial tables reported in the cross-tabulations (Tables 14-19) had either 0, 1, 2 responses in the “decreased” column, for statistical reasons this category was combined with the “no difference” category. However, for the cognitive and skills category no one put a decrease so this combination was not required. Only relationships that came out as significant were reported. Significance was determined using Chi-square.

4.5.1. Relationships with Opinions on Psychosocial Aspects

Table 14. Relationships to Developing New Friendships

		Developing New Friendships			Chi-square tests	
		Increased	No Difference +	Total	Chi-square	p-value
Played role-playing games online with others	Yes	13 (52%)	12 (48%)	25 (100%)	5.797	.016*
	No	4 (18.2%)	18 (81.8%)	22 (100%)		
	Total	17	30	47		
Played social games online with others	Yes	14 (51.9%)	13 (48.1%)	27 (100%)	8.396	.004**
	No	2 (10.5%)	17 (89.5%)	19 (100%)		
	Total	16	30	46		
Met new people while playing online games	Yes	16 (57.1%)	12 (42.9%)	28 (100%)	13.196	.000***
	No	1 (5.3%)	18 (94.7%)	19 (100%)		
	Total	17	30	47		
During the past month, when they played digital games, number of hours played	1 hr or less	0 (0%)	12 (100%)	12 (100%)	12.000	.002**
	2-3 hrs	9 (42.9%)	12 (57.1%)	21 (100%)		
	4 + hrs	7 (70%)	3 (30%)	10 (100%)		
	Total	16	27	43		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

+ Also includes a small number (0, 1, or 2 respondents) who reported a “decrease”

Table 14 displays the cross tabulations between the various categories that showed a significant relationship with developing new friendships from playing digital games. The results suggest that over half of the respondents who play MMORPGs and/or social games found that they had an increase in developing new friends compared to less than 20% for those who did not play these games (Table 14). These games are interactive

and have environments where players intermingle with each other. However, although this alone would suggest an increase in connections, it has been found that older adult gamers are less likely to interact with others while playing digital games (Nap et al., 2009).

Older adults who met new people while playing online games were more likely (57.1%) to report an increase in developing new friends than those that did not (5.3%) (Table 14). This result is somewhat expected as it seems plausible that meeting new people online would increase the chances of developing friends through playing digital games.

Those who played less than an hour at a time reported no increase in developing new friends; whereas, just under half of the individuals who played 2-3 hours report an increase, and 70% of the individuals who reported playing over 4 hours at a time (Table 14). This suggests the more hours an older adult gamer plays in a day the more likely they are to report developing new friends. However, this relationship may be reversed, in that the more friends that are made playing digital games, the more likely respondents are to invest time into the activity. .

Table 15. Relationship between Playing Social Games and Connecting with Family

		Connecting with Family			Chi-square tests	
		Increased	No Difference +	Total	Chi-square	p-value
Played social games online with others	Yes	12 (44.4%)	15 (55.6%)	27 (100%)	6.060	.014*
	No	2 (10.5%)	17 (89.5%)	19 (100%)		
	Total	14	32	46		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level
 + also includes a small number (0, 1, 2) who reported a “decrease”

Table 15 shows the relationship between playing social games and an increase in reporting connections with family. When it came to connecting with family 44.4% of respondents who play social games reported an increase in connecting to family compared with only 10.5% of respondents who do not play these games. This may suggest that playing social games online is a way for families to bond. It is possible that these games allow for a virtual space where younger generations can interact with older

generations in an informal and playful way. For example, if family members already have a connection on a social network, social games are a quick and simple way to enjoy each other's company. A recent study of Chinese families that interact on social network games found that it did not replace current relationships, but added an extra dimension and enriched other forms of communication (Chen, Wen, & Xie, 2012).

Table 16. Relationships to Connecting with Various Age Groups

		Connecting with Various Age Groups			Chi-square tests	
		Increased	No Difference +	Total	Chi-square	p-value
Played role-playing games online with others	Yes	17 (68%)	8 (32%)	25 (100%)	11.750	.001**
	No	4 (18.2%)	18 (81.8%)	22 (100%)		
	Total	21	26	47		
Played social games online with others	Yes	17 (63%)	10 (37%)	27 (100%)	8.396	.001**
	No	3 (15.8%)	16 (84.2%)	19 (100%)		
	Total	20	26	46		
Met new people while playing online games	Yes	19 (67.9%)	9 (32.1%)	28 (100%)	15.052	.000***
	No	2 (10.5%)	17 (89.5%)	19 (100%)		
	Total	21	26	47		
During the past month, when they played digital games, number of hours played	1 hr or less	1 (8.3%)	11 (91.7%)	12 (100%)	9.528	.009*
	2-3 hrs	11 (52.4%)	10 (47.6%)	21 (100%)		
	4+ hrs	7 (70%)	3 (30%)	10 (100%)		
	Total	19	24	43		

. *Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

+ also includes a small number (0, 1, 2) who reported a "decrease"

Table 16 reports the relationships found between different behaviours and an increase in connecting with various age groups. There were significant differences in a variety of digital game behaviours and reporting an increase in connecting with various age groups. MMO players (68%) and individuals who play Social Games (63%) were more likely to say they found an increase in these connections. 67.9% of respondents who had met new people playing online games also reported an increase in connecting to a variety of age groups. Thus, the more interactive games and the more interactive the player, the

more likely they are to intermingle with varying generations. Many of the social and MMORPGs have a virtual environment where players do not know each other's age, at least initially. This allows for connections to be formed without as many preconception (Cole & Griffith, 2007). Later, through conversations, age might be discussed but this is often after relationships are formed. This lack of prejudice may be part of the reason that these games allow for more intergenerational relationships. With the social games, it may also be related to the increased connections with family, which may consist of varying age groups.

Most respondents (91.7%) who played digital games for under an hour reported no increase in connecting with various age groups; whereas, the more hours respondents played in one sitting the more they reported an increase in connecting to various age groups (Table 16). There was also a similar relationship between connecting with various age groups and the number of hours played per day as seen in the developing new friendships category. The results suggest that the more time spent playing digital games, particularly games where others are playing, the more likely they are to interact with various age groups. However, once again the direction of the relationship cannot be determined, and it may be that the more individuals play with others, including various age groups, the more they will play.

Table 17. Relationship between Being Retired and Developing Self-confidence

		Developing Self-confidence			Chi-square tests	
		Increased	No Difference +	Total	Chi-square	p-value
Retired	Yes	8 (47.1%)	9 (52.9%)	17 (100%)	7.190	.007**
	No	3 (11.1%)	24 (88.9%)	27 (100%)		
	Total	11	33	44		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level
 + also includes a small number (0, 1, 2) who reported a "decrease"

Table 17 reports the finding that retired respondents were more likely to report that digital games led to an increase in self-confidence. Retired respondents had a higher rate (47.1%) of reporting an increase in feelings of self-confidence than those who were still working (only 11.1% of non-retired respondents felt there was an increase). Digital games

may be a way for retired older adults to develop self-confidence through finding achievements outside of work. This may be similar to Continuity Theory (Atchley, 1989) and subsequent findings by Nimrod (2007). Continuity Theory suggests that older adults are inclined to want to maintain a level of stability in the types of roles they fill; however, as life changes with age this becomes more difficult, and older adults attempt to maintain a level of continuity in their lives through adapting in different ways (Atchley, 1989). Nimrod (2007) suggests there is an indirect connection between leisure activities and maintaining a sense of essentiality. Thus, if retirees can keep a sense of essentiality and continuity through moving from work into a leisure activity than this would help with such things as self-perceptions and life satisfaction in their change of lifestyle. The increase in self-confidence by retired respondents may be related to this theory, in that they may have gained a level of continuity in playing digital games which helped them with their confidence levels.

Table 18. Relationships to Dealing with Loneliness

		Dealing with Loneliness			Chi-square tests	
		Increased	No Difference +	Total	Chi-square	p-value
Education Background	Less than a Bachelor degree	0 (0%)	23 (100%)	23 (100%)		
	Bachelor degree or above	5 (25%)	15 (75%)	20 (100%)		
	Total	5	38	44	6.507	.011*
Skill level in playing digital games	Beginner/ Intermediate	3 (3.8%)	29 (96.2%)	26 (100%)		
	Expert	5 (35.7%)	9 (64.3%)	14 (100%)		
	Total	8	38	46	4.703	.030*

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level
 + also includes a small number (0, 1, 2) who reported a “decrease”

Table 18 shows relationships that came out significant to dealing with loneliness. None of the respondents with less than a Bachelor degree reported that digital games

increased their ability to deal with loneliness. A quarter of those that had a Bachelor degree or above reported that digital games increased their ability to deal with loneliness.

The cross tabulations also found that those with more education (Bachelor degree and above) were more likely to state that playing digital games helped them to deal with loneliness (Table 18) and depression (Table 19). Firstly, low levels of education have been found to be a risk factor for loneliness and depression in older adults (Savikko, Routasalo, Tilvis, Strandberg, & Pitkälä, 2005). With this in mind, it might be assumed that those in the category of Bachelor degree or above are not more likely to suffer from both of these. On the other hand, none of the respondents in the study had extremely low levels of education (Table 4). Furthermore, the connections between the Internet and reductions in emotional loneliness for those with a higher education have been reported in a previous intervention study (Fokkema & Knipscheer, 2007). They suggest that the reason for their findings was that better educated people were able to pick up computer skills easier; however, they also found that this group had higher scores on loneliness from the start. Further exploration into this singularity is needed, especially on how it may relate to older adult gamers.

Skill level in playing digital games was also found to have a relationship to an increase in ability to deal with loneliness. Only 3 respondents (less than 4%) in the Beginner/Intermediate category claimed digital games helped them deal with loneliness compared to 36% of expert players; thus, expert gamers were more likely to report an increase in dealing with loneliness (Table 18). There may be a variety of reasons for this. Expert gamers may be very comfortable within the game environment, and feel that they have more control within the situations presented; thus, they may have found that they can interact with others more easily, and thus deal with loneliness. It may also be that they have invested more time into the game, and the individuals they play with (assuming they play with others), and so they are able to go online when they are in need of human interaction.

Table 19 reports the findings of those respondents who were more likely to report that digital games helped increase their ability to deal with depression. Almost one quarter of respondents with a Bachelor degree or above claimed that they increased their ability to

deal with depression compared to none of the respondents who had below a Bachelor degree.

Table 19. Relationships to Dealing with Depression

		Dealing with Depression			Chi-square tests	
		Increased	No Difference +	Total	Chi-square	p-value
Education Background	Less than a Bachelor degree	0 (0%)	24 (100%)	23 (100%)		
	Bachelor degree or above	4 (21.1%)	15 (79.9%)	20 (100%)		
	Total	4	39	43	5.571	.018*
Skill level in using computer technology	Beginner/Intermediate	1 (3.3%)	29 (96.7%)	30 (100%)		
	Expert	6 (37.5%)	10 (62.5%)	16 (100%)		
	Total	7	39	46	9.442	.002**

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level
 + also includes a small number (0, 1, 2) who reported a “decrease”

Those with expert computer skills were more likely to report digital games increased their ability to deal with depression. Table 19 shows that 37.5% of expert computer users reported this increase; while less than 4% of beginner/intermediate players reported an increase in dealing with depression. It may be that players with expert computer skills have the ability to use games in a more effective way due to their experience with computers in general, creating an ease of use. Shapira, Barak, & Gal (2007) suggested that computer skills in older adults affected their sense of empowerment and well-being through a variety of ways including a feeling of control and independence.

4.5.2. Relationships with Opinions on Cognitive Aspects

Cross tabulations were performed with the same comparisons for psychosocial aspects. Within the cognitive comparisons a combination of the no difference and decreased was not required as no one put a decrease for any of the categories (see table 12). Only the relationships that came out significant are reported.

Table 20. Relationship between Game Playing Skill and Focusing Attention

		Focusing Attention			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Skill level in playing digital games	Beginner/Intermediate	17 (50%)	17 (50%)	34 (100%)		
	Expert	12 (85.7%)	2 (14.3%)	14 (100%)		
	Total	29	19	48	5.289	.021

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 20 shows the significant relationship that came out in regards to an increase in focusing attention. Expert players were more likely to report that digital games led to an increase (85.7%) in the ability to focus attention compared to the beginner/intermediate players (Table 20). It may take a certain amount of skill before an individual becomes aware, that an improvement in the cognitive ability has occurred, or before they experience an increase in focusing attention. A similar relationship between expert players and memory (Table 21), reasoning (Table 22), and problem solving (Table 23) was also found.

Table 21. Relationship between Game Playing Skill and Memory

		Memory			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Skill level in playing digital games	Beginner/Intermediate	13 (38.2%)	21 (61.8%)	34 (100%)		
	Expert	11 (78.6%)	3 (21.4%)	14 (100%)		
	Total	24	24	48	6.454	.011*

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 21 shows the relationship that came out as significantly different in regards to reporting an increase in memory. A large portion of expert digital game respondents (78.6%) claimed that digital games increased their memory (Table 21). Similar to focusing attention, expert players were much more likely to report an increase in memory. This may be for the same reason's mentioned for focusing attention, in that it may take a certain amount of skill in digital games before the player experiences the increase in memory.

Interestingly, this finding corresponds with Boot et al. (2008) outcome that short term visual memory was better for expert gamers than none gamers. The current study did not ask more detailed questions in regards to memory, such as working memory versus long-term memory. Further investigation into this could be useful in differentiating what type of memory is being considered improved.

Table 22. Relationship between Game Playing Skill and Reasoning

		Reasoning			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Skill level in playing digital games	Beginner/Intermediate	15 (45.5%)	18 (54.5%)	33 (100%)	6.518	.011*
	Expert	12 (85.7%)	2 (14.3%)	14 (100%)		
	Total	27	20	47		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 22 shows the relationship that came out as significant in regards to reporting an increase in reasoning. Expert digital game players were more likely to find an increase in reasoning with playing digital games compared to beginner and intermediate players. Both reasoning (Table 22) and problem solving (Table 23) were also more likely to be reported by expert players as having an increase from digital games. One reason for this may be that as skill increases in a game, so do the levels. The higher levels may require more problem solving and reasoning to accomplish the goals.

Table 23. Relationships with Problem Solving

		Problem Solving			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Skill level in playing digital games	Beginner/Intermediate	15 (45.5%)	18 (54.5%)	33 (100%)	6.518	.011*
	Expert	12 (85.7%)	2 (14.3%)	14 (100%)		
	Total	27	20	47		
Played role-playing games online with others	Yes	19 (76%)	6 (24%)	25 (100%)	4.057	.044*
	No	11 (47.8%)	12 (52.2%)	23 (100%)		
	Total	30	18	48		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 23 reports the significant relationships found in respect to an increase in problem solving ability. Skill level had a relationship to reporting an increase in problem solving, with expert game players (85.7% reported an increase) being more likely to report an increase than the beginner/intermediate players (45.5% reported an increase). This finding along with the other cognitive skills that had a relationship to game expertise will be discussed in greater detail within Chapter 5.

Respondents who play role-playing games online with others were also more likely to say that playing digital games increased their problem solving abilities (Table 23). MMORPGs often create environments where there is scaffolding for problem solving within the design of the games (Dickey, 2007). Through the negotiation of various gameplay features, such as narratives, quests and character design, the choices that the players make could develop their ability to solve problems (Dickey, 2007).

Table 24. Relationships with Speed in Reacting/Responding

		Speed in Reacting/Responding			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Played social games online with others	Yes	21 (75%)	7 (25%)	28 (100%)	3.871	.049*
	No	10 (47.6%)	11 (52.4%)	21 (100%)		
	Total	31	18	49		
Met new people while playing online games	Yes	21 (77.8%)	6 (22.2%)	27 (100%)	6.146	.013*
	No	9 (42.9%)	12 (57.1%)	21 (100%)		
	Total	30	18	48		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 24 reports the respondents who were more likely to report that digital games led to an increase in speed in reacting/responding. Speed in reacting/responding was more likely to be reported as increased by those who played social games (75% reported an increase) and those who met new people playing games online (77.8% reported an increase).

Within this study speed in reacting/responding was more likely to be reported as increased by players who play social games and/or have met new people online. One possible reason for this is that the games played within these circumstances are those that require a faster speed in reacting and responding, or if they play with others online there may be more of a competitive push to react faster. As mentioned earlier, speed in reacting was mentioned by some respondents as being a difficulty, especially when compared to younger players. It may be that the awareness of the speed of others, particularly younger players, pushes them harder to improve this skill.

4.5.3. Relationships with Opinions on Skills

Similar to the cognitive aspects, no one reported a decline in technology skills. Tables 25-27 report those categories that were more likely to report that digital games led to an increase in various skills. This is important for educators and other professionals who may intend to use digital games as a training or learning platform.

Table 25. Relationships with Computer Skills

		Computer Skill			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Played role-playing games online with others	Yes	16 (64%)	9 (36%)	25 (100%)	5.965	.015*
	No	7 (29.2%)	17 (70.8%)	24 (100%)		
	Total	23	26	49		
Met new people while playing online games	Yes	17 (60.7%)	11 (39.3%)	28 (100%)	4.978	.026*
	No	6 (28.6%)	15 (71.4%)	21 (100%)		
	Total	23	26	49		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 25 shows the findings of those respondents who were more likely to report an increase in computer skills. For developing new skills, about two-thirds of respondents who played MMORPG's or/and met new people while playing games online reported an increase in computer skills, compared to only one-third who said they did not. This may be because these games can be quite complex and often prompt players to understand computers better as it allows them to understand the game better.

Table 26. Relationship between Playing MMORPGs and Internet Skills

		Internet Skills			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Played role-playing games online with others	Yes	15 (60%)	10 (40%)	25 (100%)	5.598	.023*
	No	6 (26.1%)	17 (73.9%)	23 (100%)		
	Total	21	27	48		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 26 shows the finding that MMORPG players were more likely to report an increase in Internet skills from playing digital games. Almost two-thirds of MMORPG players reported that digital games led to an increase. This finding may be similar to the computer skill results above (Table 25), in that it may be due to the complexity of the game and that it may promote players to look up information on the Internet, interact on the Internet, and have a better understanding of how to navigate the Internet. This assumption

can also be made by the fact that some of the respondents were recruited from guild websites, and these have vast amounts of information, lounge rooms, voice chat, reviews, blogs, and information on apps, to name a few.

Table 27. Relationship between Sex and Digital Game Playing Skill

		Digital Games Skills			Chi-square tests	
		Increased	No Difference	Total	Chi-square	p-value
Sex	Female	17 (70.8%)	7 (29.2%)	24 (100%)	4.001	.045*
	Male	18 (94.7%)	1 (5.3%)	19 (100%)		
	Total	35	8	43		

*Significant at the .05 level; **significant at the .01 level; ***significant at the .001 level

Table 27 is those respondents that were more likely to report an increase in their digital game skills from playing digital games. Overall most respondents claimed that playing digital games increased their skill in digital games; almost all males stated that they increased while only 70% of females reported an increase in digital game skill.

Interestingly, woman were more likely to report no improvement. This is the only aspect within any of the categories that gender was found to have a significant difference in the cross tabulations. Further investigation is needed to understand why women are less likely to report improvements in their digital gaming skills as the result of playing digital games.

5. Discussion and Conclusion

5.1. Summary

There is an increasing older population (WHO, 2002), with estimates of Canada's older demographic (+65) reaching 23% of the population by 2031 (Statistics Canada, 2011). This has led to amplified discussions, policies, and research on older adults. Of importance, when considering older adults, is how to maintain and improve quality of life so they can remain independent and enjoy life (Sixsmith, 2013). This has brought about ideas of successful aging. Within discussions on successful aging many researchers have theorized what it should include, moving from a biomedical model which is focused on the absence of disease (Rowe & Kahn, 1997) to a more holistic perspectives which considers psychosocial aspects and other areas of a person's life (Depp and Jeste, 2006; Bowling & Dieppe, 2005). Often included within successful aging categories are physical health, cognitive health, psychosocial factors, and such aspects as leisure activities. The type of leisure activities engaged in may affect the other areas (Menec, 2003; Verghese et al., 2003); however, any of these factors may affect one another (Sixsmith et al., 2007). One holistic approach to theorizing an individual's life is a life course perspective. This allows for the examination of various influences on a person's life including historical and social, while also considering transitions that might occur with the process of aging.

Technology can play an important role in successful aging and quality of life and can influence a person's life course. To start, there are many technological devices that allow older adults to stay at home longer (Sixsmith, 2013). Among other uses, computers have been a source of obtaining health information, communicating with others, and used as a leisure activity, which in turn may improve a person's quality of life. Older adults who have access and ability to use computers may be at a distinct advantage over others who do not for these reasons (Baecker et al., 2012).

One area of technology that is gaining interest among researchers is the use of digital games. Research and design into digital games for older adults has taken on momentum and has recently led to such projects as Eldergames (Gamberini et al. 2006) and Silverpromenade (Gerling et al., 2011). It has been shown in previous studies that the

possibility of digital games for increasing social capital and its use for psychological gains are promising (Nap et al., 2009; Wollersheim et al., 2010; Allaire et al 2013). Indeed, the current study found that connections with others are often increased, especially through certain types of games. Furthermore, there has been an increase in research looking into digital games for a cognitive purpose (Basak et al., 2008; Whitlock et al., 2012). As we learn more about the brain and cognition, the more we understand that although there is a slowing in various functions as people age, there are also ways to decrease this process and hopefully reverse it to some degree. This has led to growing interest in using digital games as an intervention for older adults. Finally, digital games for learning is also of interest, particularly for building Internet and computer skills. Digital games may be artifacts by which knowledge can be shared but also provide a place for knowledge construction through social interactions with others. As mentioned previously, computer literacy may be a distinct advantage to older adults. Digital games as a method for increasing these skills in the older population has had positive results (Wang et al. 2011). With all the promising investigations and theory of digital game use for older adults, there are still limited studies. The current study attempted to fill in the gap of whether older adult gamers perceived digital games as increasing various factors often associated with quality of life and successful aging; these being psychosocial, cognitive and skill development aspects.

The current study investigated older adults over the age of 55 who played digital games at least once over the last year. These individuals were mainly recruited from online websites. They agreed to participate in a survey that examined the characteristics, patterns of use, games played, playing with others, and their perceptions in regards to the benefits and difficulties, with a particular focus on psychosocial, cognitive, and technology skills. Running cross-tabulations revealed some interesting relationships between specific questions related to patterns of use, games played with others, and characteristics with the reported psychosocial, cognitive, and skill development benefits (as there was such a low number of respondents reporting a decrease, only the increase was considered). This provided a further understanding of the outcomes and what might increase the different areas. The individual results of each category are interesting; however, as a whole they suggest that digital games may be useful in maintaining or increasing the quality of life of older adults. Considering the importance of having a holistic approach to aging, which is

focused on supporting older adults in living happy active lives, the findings offer positive results for the use of digital games and provide suggestions for future research.

Key Findings:

- Digital games are reported by many respondents to increase various areas of psychosocial, cognitive and computer skills.
- Digital games may be useful for social capital, particularly MMORPG games, social games, meeting new people online, and if they play for a certain amount of time in one session.
- Digital games are seen by many participants as increasing the cognitive abilities: Memory, speed in reacting, focusing attention, reasoning, and problem solving.
- Expert players are more likely to report an increase in cognitive abilities.
- Internet and computer skills were reported to be increased by almost half of participants which may be important for learning. This was more likely to be reported as increased by MMORPG players.

5.2. Further Interpretation of the Findings

The results of the current study were similar to previous investigations for many of the characteristics and patterns of use. For example, the slightly higher female ratio, moderate to high education, consistency of playing, playing digital games for over 10 years, and the main platform used being the PC were all similar to previous findings (ESA Canada, 2012; De Schutter, 2011; Pearce, 2008). However, the current study had a higher portion of individuals who play MMORPGs and social games than has previously been found. There may be a few reasons for this. Firstly, there was a high proportion of young older adults, and so the age group was more consistent with the baby boomer generation seen in Pearce's (2008) study. Secondly, some websites recruited from were guild websites for MMORPGs. Furthermore, a recent study by Delwiche & Henderson (2013) found that there are an increasing number of older adults (50+) playing MMORPG's. Over half of the respondents in the current study also played social games, such as those played on social network sites like Facebook. There have been very few studies conducted on older adults and social games. Any game played with others online may have benefits for social capital.

5.2.1. Psychosocial Considerations

- Digital games may be useful for social capital, particularly MMORPG games, social games, meeting new people online, and if they are played for a certain amount of time in one session.

The psychosocial areas which respondents reported the highest increase were those related to connecting with other people. The potential for digital games to increase socialization is important for the emotional health benefits that such connections can have (McLaughlin et al., 2012). These social relationships may also affect a person's life course. Within this study, findings such as an increase in social connections, especially for players who play games with others online (either MMORPG or social), is encouraging for future research and therapy that may want to increase social capital for certain individuals. Social capital has often been considered an important aspect in the well-being of older adults (Adams et al., 2011; Reichstadt et al., 2010; Theurer & Wister, 2010), and this study suggests that many players experience an increase in connecting with various people through playing digital games.

Of these, the intergenerational connections and the general health benefits, to both the young and the old, that these relationships can provide are promising (Khoo et al., 2008; Vaida & Greenberg, 2009). It is encouraging that digital games may also serve as a way to get older adults back in touch with other generations, especially where these relationships may have been lost. Within the psychosocial category, the highest reported increase was for connecting to various age groups (almost half of all respondents). This is important as previous research has found that intergenerational relationships has positive results for increasing some areas related to quality of life, including a higher sense of emotional well-being (Weintraub & Killian, 2007) and life satisfaction (Meshel & McGlynn, 2004). Along with previous studies (Khoo et al., 2008; Nap et al., 2009; Wollersheim et al., 2010; Vaida & Greenberg, 2009), the current study points to the possibility of digital games being used to increase these intergenerational contacts. Furthermore, the cross-tabulations revealed that this was particularly significant for those individuals who met new people playing online games, those that played social games and/or MMORPG's, with over two-thirds in these categories reporting an increase in

intergenerational connections. Interestingly, various studies and designs have aimed at making intergenerational games (ex. Age Invaders); however, this study may indicate there is an effect regardless of whether the game is intended for the specific purpose of having varying age groups mix. In virtual environments such aspects as age, sex, and sexuality, may not be barriers to interaction (Cole & Griffith, 2007). This opens up opportunity to connect to individuals that a person might not normally associate with. For this reason these gaming environments may help to reduce ageist views.

Respondents added the slowing of reflexes as a difficulty of digital games, with one of the respondents mentioning they could not keep up with younger players. This is interesting since it brings about questions of the role of older adults within online gaming communities. Previous studies have found that older adults sometimes play an important leadership and organization role (Pearce, 2008; Delwiche & Henderson, 2013). Studies involving older adults in online gaming environments could go further into exploring the role these players have, how it differs from those of a younger age, and how the transitions into changing roles occur within a trajectory. Such investigations may help older adults to better understand virtual environments and the possibilities for varying relationship dynamics.

Previous work has found that at times older adults are concerned about meeting new people online (Nap et al., 2009). However, within this study almost two-thirds of respondents met new people, and over a third developed new friendships, with that rising to over a half for those who play MMORPG's and/or social games online. This is promising for increasing social capital through the development of new friends, which can be some of the strongest ties in relation to older adult well-being (Litwin & Shiovitz-Ezra, 2011).

Over a third of respondents reported developing friendships through playing digital games. Furthermore, there was a significant difference in those who reported this increase in relation to whether they played online games. It is not surprising that over half of those who play digital games within virtual spaces with others experienced an increase in new friendships, particularly as many of these games promote interaction through their designs. For example, many of the social games, such as those found on Facebook, have bonuses focused on inviting people to be neighbours or friends. The more friends you have in your game, the higher your game score can get. This can be an initial motivation

for inviting new people, and as they share and help each other within the game, stronger relationship ties can be formed (Wohn, Lampe, Wash, Ellison, & Vitak, 2011). A similar mechanism can be seen in MMORPG's, especially at higher levels where to get ahead players need to interact with others. For example, when players go into dungeons and raids they must be part of a group, and although it can be done with random players, it is often more beneficial to become part of a guild that regularly organizes such activities. Furthermore, players often have their own story line, but also interact with others' narratives within the game (Dickey, 2007). Through these interconnected narratives players can easily become involved in each other's narratives and influence the outcome in some way (Dickey, 2007).

Another interesting relationship revealed within this study was that for older adult game players to develop new friends and/or increase interactions with various age groups, they may require a certain amount of time in a game session before they are able to increase these connections. Not one participant who played less than an hour at a time claimed that they developed new friendships, yet with the more hours a respondent reported playing at one time, the more likely they were to develop new friendships and connect with other age groups. This could be for a variety of reasons. Firstly, to meet people may take a certain amount of time in a game session. Secondly, developing friendships is also likely to take a certain amount of time. Finally, it may be difficult to determine which way the relationship between time and connecting to others go. It could be similar to De Schutter's (2011) study where social interaction was a predictor of time spent within the game. Thus, once they have met people online, and their lives are linked, they may be more likely to invest more time in the game.

The fact that over half of respondents reported playing with family and/or friends demonstrates increased opportunities for maintaining or expanding social contacts. There have been digital games designed to provide a game environment that promotes connecting with varying generations of family members (see Age Invaders) (Khoo et al., 2008). Furthermore, Delwiche & Henderson's (2013) study found that playing with family was a major motivation to play the MMORPG game Wizard 101. Although the current study cannot claim it as a major motivator, it was promising that over half of respondents reported playing digital games with family and about one third of respondents reported an increase in connection to family. Future research could examine the family relationships

and experiences at a deeper level to determine the exact mechanisms of play and game design that increase bonding.

Almost one-third of respondents claimed an increase in self-confidence. A possible connection is that previous studies have found a relationship between self-confidence and lesser cognitive and fine-motor skills later in life (Caplan & Schooler, 2003). Digital games may increase these cognitive and fine motor skills, leading to an increase in self-confidence. However, the exact mechanism that may be involved in increasing self-confidence is difficult to determine and requires further investigation.

It was found that almost half of retired respondents reported that digital games increased self-confidence. It was surprising that the retired respondents were not more likely than non-retired respondents to report an increase in the cognitive aspects; this was expected since they are no longer actively involved in daily employment. However, the fact that digital games helped their self-confidence is promising for future work, especially in situations where individuals are having a difficult time with transitioning into retirement. As discussed within the results, this relationship may be related to continuity theory (Atchley, 1989). Digital games may provide a leisure activity that can be an indirect route for maintaining a sense of essentiality (Nimrod, 2007), and thus through achievements within the game, respondents may gain increased self-confidence through play.

In regards to depression and loneliness, there needs to be a more thorough investigation looking at individuals who have stated that these are problems they suffer from before any conclusions can be drawn, especially as the current sample was quite small. Furthermore, it may also be beneficial to have an intervention study where pre and post tests are conducted to see if there are actual changes. Although there have been games designed for depression that have had successful results (see Merry et al., 2012), knowing whether gameplay within itself works or whether there are certain game types that allow for better results is important. Also finding out what the mechanisms involved are also important; for example, is it related to the ability of casual gameplay to reduce stress (Russoniello et al., 2009).

5.2.2. Cognitive Considerations

- Digital games are perceived by many participants as increasing the cognitive abilities: Memory, speed in reacting, focusing attention, reasoning, and problem solving.
- Expert players are more likely to report an increase in cognitive abilities.

Cognitive abilities came out as one of the most promising areas in this study. The fact that 88% of respondents felt that mental stimulation was one of the main benefits of digital games was important, since this shows that almost all of the respondents within the study believed that digital games encourage cognition. When considering specific cognitive abilities, and whether they were increased or decreased through gameplay, the results were also very promising. All of the cognitive abilities were reported as increased by 49-63.3% of respondents. Considering the current interest with digital games and cognitive stimulation, it is promising that older adult gamers often perceive certain areas improved through gaming activities. It is one thing to have positive results regarding cognitive abilities, and another to be aware of these.

There was an interesting relationship between many of the cognitive abilities and whether the participant claimed to be an expert digital game player or not. For example, expert players were more likely to report an increase in memory (79%). A study by Boot et al. (2008) had similar results regarding memory and expert players. Furthermore, even when they trained non-players in the action game, it did not result in an increase and they concluded more time was likely needed. These results along with the current study highlight a few issues, in particular, many intervention studies are conducted over a short period of time, which may limit the possibility of participants developing expertise and showing increases in cognitive skills.

Memory was not the only cognitive ability that expert gamers were more likely to report an increase. The other areas noted were focusing attention, reasoning, and problem solving. Nevertheless, there was no statistical difference for this group with regard to speed in reacting. The three cognitive abilities mentioned above are complex processes involving multiple domains (Hung & Van Eck, 2010). It may take a certain amount of time and skill before an individual becomes aware that an improvement in the cognitive ability has occurred, or before they experience an increased ability in these areas. Furthermore,

experts often play the game at a higher level of challenge and complexity. The way in which many games are designed allow for continual skill development and tend to become more challenging as the game progresses. Once again the relationship is difficult to determine since there could be a difference in the direction in which this occurs. It may be that the better the person becomes at the game, the more their cognitive abilities improve. However, it is possible that expert gamers become experts because they are more able to improve these areas from the start. Furthermore, it may be related to game flow experience where learning becomes easier with previous knowledge (Kiili, 2005). Increased state of flow for older adults with gaming experience has been noted in prior research (Gerling et al., 2011). Finally, cognitive abilities may be contextual and/or domain specific. This was found in a study by Sims & Mayer (2002) looking at spatial expertise. They used the game Tetris and found that the spatial expertise was not transferred to other activities where spatial ability was required. Thus, experts may become excellent at certain cognitive abilities within the game but this may not transfer to outside experiences. However, with games that involve narrative, interaction, and complex thinking using a variety of cognitive abilities, it may be very different. Shaffer (2006) argues that many digital game environments can build epistemic frames in which gaming experience can transfer into real world experience. Further research is required, especially for older adults where a slowing of the cognitive processes may occur.

Although skill in playing computer games seemed to have a large influence on whether or not respondents found the cognitive abilities improved, respondents who played MMORPG's (76%) were also more likely to report improvements in their problem solving skills. Previous research that examined World of Warcraft forums suggested that these games promote scientific thinking and problem solving (Steinkuehler & Duncan, 2008). Since World of Warcraft was the main game mentioned by players in this study (26%), it may confirm these previous results by suggesting older adult MMORPG players also believe problem solving skills are increased through such games. As mentioned previously, the problem solving skills may be specific to the gaming environment, and more research needs to be conducted on the transferability of these skills to other domains.

The overall improvements in problem solving and reasoning, as reported by respondents in this study, may have other potential benefits. These findings suggest that

digital games can be useful, not only for stimulating cognition, but also as an avenue to further opportunities in education and learning for older adults. As Gee (2003) pointed out, digital games offer a place “to solve problems and reflect on the intricacies of the design of imagined worlds and the design of both real and imagined social relationships and identities in the modern world (p.48)”. Although this has often been discussed in the literature for why digital games are promising for younger players (Gee, 2003; Childress & Braswell, 2006; Barab et al., 2010), the potential for learning through online games for older adults is an area that requires further exploration. Furthermore, understanding virtual worlds may be useful for generations that have not grown up with these types of environments, in that there may be an opportunity for communicating with those who are used to virtual spaces. This may partially explain why previous research (such as Wollersheim et al., 2010) has found digital gaming allowed older adults to feel more connected to the outside world. Not knowing, and only observing these spaces from an outsider perspective may create misunderstanding of this technology and these virtual spaces.

5.2.3. Skill Improvement and Learning

- Internet and computer skills were reported to be increased by almost half of participants which may be important for learning. This was more likely to be reported as increased by MMORPG players and those who met new people online (for computer skills) suggesting the role of interaction.

The level of skill of the respondents, whether with games or computers, is also interesting since very few reported being beginning users. In general, most of the respondents within the study considered themselves to be intermediate and expert computer users, which would suggest that for this selection of older adults there is no digital divide. It also brings into question any views that may suggest older adults cannot master computers or games. It would be interesting to do a further exploration to see if playing digital games helped respondents move from the beginner to intermediate stage.

As for the influence of digital gameplay on their computer, Internet and gaming skills, just under half suggested that it helped to increase their computer and Internet skills whereas 81.3% reported that it helped with their digital gaming skill. It was assumed that this final skill would be reported as increased since participating in an activity should

increase your ability to perform with increased practice. These results are promising for using digital games as educational tools for older adults. Furthermore, various studies report that many older adults accept the potential of using digital games for learning within the older adult community (Pearce, 2008; Wang et al., 2011; Nap et al., 2009). These results suggest that playing digital games may allow older adults to have meaningful experiences that will help with knowledge construction around technology use (such as internet and computer) and content. Although many younger generations in our society can't imagine their lives without the internet (Oblinger, 2003), many older generations may not have had the same cultural integration of technology; and thus, participating in social practices surrounding Internet and computer use may be a useful experience for knowledge construction in this area.

The results of the current study, in regard to learning and increasing skill, can be discussed with consideration of Wang & Burton's (2010) three reasons that digital games may be useful in educating older adults on computer skills. Firstly, Wang & Burton state that digital games are engaging and help to increase motivation. This study found that 88% of participants found that enjoyment was one of the main benefits of games. Furthermore, most players were fairly regular in their game playing, in that many played 5-7 days a week. Older adults, once engaged in digital games are often consistent and regular players (ESA Canada, 2012; Delwiche & Henderson, 2013).

Secondly, many games require minimal computer skills to start, yet as they progress there are often opportunities to improve game and computer skills (Wang & Burton, 2010). Within the current study many of the participants claimed to be intermediate or expert computer users. However, almost half reported that their computer and Internet skills were increased through digital games, suggesting that digital games are an informal way to increase digital literacy.

Thirdly, the embedded virtual environments may create opportunity for increased interactions (Wang & Burton, 2010). As mentioned previously, social interactions are an important part of knowledge construction (Vygotsky, 1978). In the current study, older adults who met new people online were more likely to report an increase in computer skills, while those that played MMORPGs were more likely to report increases in computers and Internet skills from digital gameplay. Although it is difficult to determine the

exact relationship, Pearce (2008) found that 75% of baby boomers reported that they enjoyed helping others, and a study by Wang et al. (2012) also found that respondents reported improvements to their computer skills as the result of the assistance they received from online friends. Thus, it is possible that individuals playing digital games help each other in various ways. Through forming these new relationships they may be able to generate an informal teaching and learning environment. Creating older adult communities through online digital games may provide an opportunity for a Community of Practice (Wenger, 1998) to occur in which members help and motivate each other. This may allow for a collaborative environment in which knowledge construction can occur.

5.2.4. Considerations for Quality of Life and Life Course

- Digital games are reported by many respondents to increase various areas of psychosocial, cognitive and computer skills.

Together these findings show promise for the possibility of improving quality of life for some older adults, in several areas. When considering a holistic view of quality of life that incorporates physical health, psychological health, cognitive health, leisure activities, and other areas, then the findings of the current study become exciting, because many respondents found an increase in one or many areas. This study points to quality of life being improved from playing digital games through an increase in social capital and connections to others, by enhancing cognitive abilities and by allowing informal learning so that Internet and computer skills can be further developed. Although cognitive abilities seem to have the highest reported increase, the psychosocial and skill building were also promising. Furthermore, although this study did not cover it, games may also be used for physical activity and therapy, depending on the game design. The potential of digital games for engaging individuals is in itself important for compliance. Many games allow players numerous freedoms, including how to play and with whom. It is precisely the freedoms that the games afford that make them unique for a multitude of uses (Klopfer et al., 2009).

Leisure activities, within themselves, are often important to quality of life and successful aging (Lee et al., 2011). Digital games have the potential for offering a leisure activity that can incorporate several areas to improve or maintain at one time. A holistic approach that is engaging and focuses on prevention and maintenance of health, rather

than the problems of disease, is important for this population (Sixsmith, 2013), and digital games may offer one avenue of providing a playful, entertaining way to do so. Furthermore, the importance of play throughout the life course should not be underestimated in the benefits it may provide, to quote George Bernhard Shaw (n.d.), "We don't stop playing because we grow old; we grow old because we stop playing." Technology has offered older adults a way to create their own fun and play even when specific paths are not available (Nimrod, 2011). The fact that 88% of respondents in the current study reported enjoyment as being a main benefit is promising for intervention work. If studies find that some of these games do increase a number of areas related to quality of life, as indicated by many of the respondents in this study, then it may be a pleasant way to keep older adults involved in a therapeutic activity.

In regards to a life course perspective a few aspects could be considered in regard to this survey. Firstly, without having the background of the current respondents it can be difficult to determine the trajectories and decisions made previously that led to the integration of digital games into their lives. However, as many players have played for over 10 years, and they play regularly, digital games within the life course of many of the respondents of the survey seem to be integrated into their lives over a certain amount of time. Also, many of the players that responded to the survey were of the younger older adult categories (ages 55-59 and 60-64). These are more in line with the baby boomer cohort. Computers were likely introduced into their work place and homes before retirement. Also this generation may have had children at home during the introduction of household computers, which may have influenced what the device was used for. Furthermore, those who answered were more experienced computer users and game players, suggesting a certain integration of this technology into their lives. Also the respondents were fairly educated and this may have influenced their uptake of technology. However, it has been argued that computer use is not always stable and people move through different amounts of technology use throughout their life course (Selwyn, 2004). Further investigations into how playing digital games became a regular part of their lives would be useful in gaining a better understanding of the survey results.

Many of the respondents reported linking their lives with others online, forming social networks outside of traditional forms. For many respondents interactions over the Internet would be a relatively new form of communication as they would not have had it

for most of their life course. It is important to understand social relationships in an individual's life as they affect a person's life course. Thus, these linked lives through playing digital games may be important for further investigation. Of particular interest within the survey was the reported increase in intergenerational relationship. It has been argued that these will become of increasing important to a person's life course due to increased life expectancy (Bengston, 2001). Families will be spending more time together and grandparents may have an increasing role in fulfilling family duties (Bengston, 2001). It would be beneficial to have further investigation into these relationships and the effect on the individual's trajectories.

5.3. Limitations

There were a few limitations to this study which could be improved in future research. The first point is that although 50 respondents is a reasonable sample size, a larger sample would allow for a greater degree of generalizability. Secondly, due to the nature of recruitment, and looking for specific groups, random sampling was not used. Furthermore, the sample turned out to consist of 100% Caucasian respondents which may limit a variety of cultural considerations that would be interesting to look at in future work.

Although the survey was well-designed, going through numerous drafts and edits with many different people, there were still some questions which may be considered slightly problematic. To start with, loneliness and depression are difficult to measure because an individual will not say that digital games increased their ability to deal with depression if they have not been suffering from depression in the first place. Furthermore, the wording "Do digital games increase your ability to deal with depression" is tricky and possibly slightly confusing. However, the results on these two questions did not vary greatly from the others suggesting that it was not completely misunderstood. In general, if the question was particularly confusing there would be an unnatural reporting of decrease in these categories compared to the others and there was not. Another question that was slightly problematic was an oversight to adding "guild members" to the question of "who do you play with online?". Some individuals added this to the "other" selection. Considering some of the websites recruited from, if this had been an actual choice on the survey it would likely have been chosen more frequently. Association was on the list and there is a

good possibility people interpreted this as a guild, due to the number of people that chose this (almost a quarter). Finally, as with any self-reported data, it is only the individuals' opinions on an increase within the areas investigated.

5.4. Conclusion

This study of a group of 50 older adults (aged 55+) who play digital games is an initial look at the possible benefits of digital games. Besides the high number of MMORPG players, many of the patterns of use and characteristics within this sample were consistent with previous surveys. However, this study adds to previous research by giving insight into whether older adult gamers believed that playing digital games increased their psychosocial, cognitive, and technology skills. This is one of the first studies, that I am aware of, that has looked specifically at the opinions of older adults in regard to these areas. It is important since it provides information to whether older adults perceive certain effects of playing digital games on their life, as this can help to guide future design and interventions.

The findings that digital games are considered to have a lot of positive benefits (cognitively, socially and with regard to skill development) for the older adult gamers in this study is promising for future research looking into using digital games as an intervention for improving quality of life. The further insights into specific characteristics and patterns of use that may result in a higher alleged increase also provide important information. For example, for research looking into cognitive improvement through using digital games this study suggests that a certain amount of experience, and thus time, might be required before the improvements are noted. Similarly, using games to increase social capital will benefit from considering interactive games that are played for longer sessions. These findings are particularly exciting because digital games are an engaging and enjoyable way to approach increasing abilities. In the most basic terms "life is more fun when you play games" (Dahl, R., 1979, p.117). Being able to improve various areas of life, while participating in an engaging activity, is wonderful for the future of intervention therapies.

However, the conclusions within this study must be viewed cautiously due to the relatively small sample size and limited recruitment methods. Further steps would be to conduct a large-scale survey of the general population and have a comparison group with non-players. Currently, there is such a study being conducted, and it will be interesting to compare the results of the current study with the larger Canadian study of approximately 450 digital game players and another 450 non-digital game players (Kaufman, 2013). Also, the results of the current study are encouraging for conducting interventions, such as using a MMORPG game to increase social capital and/or computer skills. Qualitative studies may also need to be done in this area to fully understand how relationships are being formed and experienced, as well as the underlying mechanisms involved. This could be done through a variety of methods. Firstly, case studies may allow for in-depth understandings about the process and experiences of older adult gamers to get a better understanding of the individual life course. It would allow for a better understanding of histories and the choices made that led to playing digital games, while also providing an opportunity to explore relationships that occur through playing digital games. Furthermore, a phenomenological study might be useful in exploring the lived experience of digital gameplay for older adults. This will allow for a more in-depth understanding on the phenomena of playing digital games among older adults.

Overall, this study provides a positive starting point to determining whether digital games may improve or maintain quality of life in older adults. Improving lives through play is an appealing idea, and play within itself can lead to powerful learning and experiences (Vygotsky, 1978; Gee, 2003). The potential for digital games to allow virtual adventures while playing with others, even when a person is homebound or isolated, is exciting. It may be that in our technologically focused culture, digital games are a way to assist older adults in feeling connected with the world, while providing an engaging, social, and cognitively stimulating environment. Outdated views that play is only for children, or that play serves little purpose but frivolous enjoyment, are not advantageous in modern society. This study illustrates that neither of these statements are true. Indeed, it would seem that older adults find gameplay a useful way to increase various aspects of their lives. Conceivably, play is not only for the young, but is something that can be used throughout the life course to connect, stimulate, and bring joy to all stages of development.

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Appendices

Appendix A.

Consent Form

Date: Jan 14, 2013
Application number: 2012s0964
Simon Fraser University
Faculty of Education
8888 University Drive, Burnaby BC,
Canada V5A 1S6

Participant ID _____

Consent Form

The University and those conducting this research study subscribe to the ethical conduct of research and to the protection at all times of the interests, comfort, and safety of participants. This research has received ethics approval and is being conducted under permission of the Simon Fraser Research Ethics Board. The chief concern of the Board is for the health, safety and psychological well-being of research participants.

Title: Experiences and opinions of digital game play by older adults

Principal Investigator: Simone Hausknecht
Under the supervision of Dr. David Kaufman, Professor, Faculty of Education

Goals

The aim of this study is to explore the patterns, experiences, and opinions of older adults who play digital games.

Benefits of the study to the development of new knowledge:

This study will inform future work on the benefits and difficulties of using digital games for older adults. It will particularly inform researchers and designers who are exploring ideas of using digital games to enhance quality of life, including cognitive and social aspects.

Procedure: You will partake in a questionnaire that will take approximately 10-15 minutes. At any time you may withdraw from the study. At the end of the study a separate link will be available for you to provide your information to enter the draw for three cash prizes of \$50. No future contact will be made after completion unless you have indicated that you would like a copy of the results or you have won the draw.

Provision of confidentiality

Your identity will remain confidential at all times. The survey is conducted over a secured web server housed in Canada and therefore confidentiality can be guaranteed. Your identity will not be linked to your survey to guarantee confidentiality. However, to participate in the three cash draws of \$50 a separate link is included at the end of the survey. The information that is collected if you would like to be part of the draw will be stored on a websurvey on the SFU server which is also housed in Canada. After collecting the survey data, a database without respondent identities will be created and analyzed and this information will be downloaded onto a USB storage device (flash drive) that will be kept in a locked cabinet in the office of Dr. David Kaufman. Data will be stored for 2 years.

Risks

No risks are associated with this study

All concerns, complaints, comments, and the results can be obtained from David Kaufman, Faculty of Education, 8888 University Drive, Burnaby BC, Canada V5A 1S6, email - [REDACTED] at [REDACTED]

All other concerns can be sent to Dr. Hal Weinberg, Director of research ethics, 8888 University Drive, Burnaby BC, Canada V5A 1S6, Office of Research Ethics, email - [REDACTED]

By selecting "I agree to participate" below you confirm that you:

1. Understand what is required based on the above information
2. Understand that your participation is voluntary and you are free to withdraw at any time
3. Understand the provisions for confidentiality

I agree to participate.

I don't want to participate

Appendix B.

Survey of older adults and game playing

**Simon Fraser University
Faculty of Education
Experiences and opinions of digital game play by older adults**

This survey is designed for adults aged 55 years and over.

1. What are your three main leisure activities? (for example, TV, movies, walking, sports, bingo, photography, internet, etc.)

- a) _____
b) _____
c) _____

Non-Digital Games refer to all types of games that don't require the use of digital devices to play. Some examples include social games such as Trivial Pursuit, Monopoly, Concentration, Clue, card games such as Patience, Bridge, Hearts, Crazy Eights, Checkers, and Chess. Casino games such as slot machines are considered as non-digital games since skill is not required.

2. Have you played **non-digital games** in the past year?
a) Yes (**GO TO A**)
b) No (**GO TO B**)

A. NON-DIGITAL GAMES

3. When you have played games, how many hours on average did you play in a day?
a) 1 hr or less b) 2-3 hrs c) 4-5 hrs d) 6-8 hrs e) More than 8 hrs

4. Which games have you played? (For example, card games, board games, other)?

- 1) _____
2) _____
3) _____

5. With whom have you played non-digital games? *(select all that apply)*
- a) On my own
 - b) Family members (e.g., partner, children, relatives)
 - c) Friends
 - d) With members of a club or association
 - e) Other _____
6. Why do you play non-digital games?
7. What do you think are the greatest benefits of playing games? *(select all that apply)*
- a) Mental exercise
 - b) Social interaction
 - c) Enjoyment (fun)
 - d) Escape from daily life
 - e) Other _____

B. DIGITAL GAMES

Digital Games refer to all types of video games and computer games, whether played on computers, handheld devices, video game consoles or other means. Casino games that require skill such as poker or blackjack are considered as digital games.

8. Have you played digital games in the past year?
- a) Yes (**GO TO Q. 9**)
 - b) No (**GO TO C**)
9. How many years have you been playing digital games?
- a) Less than 1 year
 - b) 1-4 years
 - c) 5-9 years
 - d) 10 + years
10. Have you played digital games in the **past month**?
- a) Yes
 - b) No
11. During the past **month**, how many **days per week on average** have you played digital games?
- a) 0
 - b) 1
 - c) 2
 - d) 3
 - e) 4
 - f) 5
 - g) 6
 - h) 7
12. During the **past month**, when you played digital games, how many **hours per day on average** did you play?

- a) 1 hr or less b) 2-3 hrs c) 4-5 hrs d) 6-8 hrs e) More than 8 hrs

13. What is your skill level in playing digital games?

- a) Beginner (Low level) b) Intermediate (Middle level) c) Expert (High level)

14. What is your skill level in using computer technology/Internet?

- a) Beginner (Low level) b) Intermediate (Middle level) c) Expert (High level)

15. Which digital games have you played, either alone or with others?

1) _____

2) _____

3) _____

16. Which of the following devices did you use to play digital games? (*select all that apply*)

- a) A video game console (example: Xbox, Playstation, Wii)
b) Portable device (example: Nintendo DS, Gameboy, Playstation PSP)
c) Desktop or laptop computer
d) Handheld device (example: iPhone, iPad, Android, Blackberry, other tablets)
e) Digital game machine in a casino

17. Have you played role-playing games online with other players? (e.g., World of Warcraft, Everquest)

- a) Yes b) No c) Don't know what this is

18. Have you played social games online with other players? (e.g., bridge, chess, scrabble, Facebook games)

- a) Yes b) No c) Don't know what this is

19. Have you met new people while playing these online games?

- a) Yes b) No

20. Have you played digital games? (*select all that apply*)

- a) Alone
b) With others who are in the same room with you
c) With others online through the internet

21. With whom have you played digital games? *(select all that apply)*

- a) On my own
- b) Family members (e.g., partner, children, relatives)
- c) Friends
- d) Members of a club or association
- e) Others _____

22. What do you think are the greatest benefits of playing digital games? *(select all that apply)*

- a) Mental exercise
- b) Social interaction
- c) Enjoyment (fun)
- d) Escape from daily life
- e) Other _____

23. What are your main difficulties in playing digital games? *(select all that apply)*

- a) Difficult to see or hear
- b) Too complicated
- c) Privacy
- d) Difficult to use controller
- e) Limited or no access to technology
- f) Other _____
- g) None

24. In your opinion, has playing digital games increased or decreased the following:

Social & Emotional	Increased	No difference	Decreased
Developing new friendships			
Connecting with current friends			
Connecting with family			
Connecting with various age groups			
Developing self-confidence			
Dealing with loneliness			
Dealing with depression			

25. In your opinion, has playing digital games increased or decreased the following:

Cognitive	Increased	No difference	Decreased
Focussing attention			
Memory			
Reasoning			
Problem solving			
Speed in reacting/ responding			

26. In your opinion has playing digital games increased or decreased the following:

Technological Skills	Increased	No difference	Decreased
Computer skills			
Internet skills			
Digital game-playing skills			

C. Background/Demographics

27. Sex:

- a) Female b) male

28. Age:

- a) 55-59 b) 60-64 c) 65-69 d) 70-74 e) 75-79 f) 80-89 g) 90 +

29. Primary language

- a) English b) French c) Other _____

30. Country:

- a) In which country were you born? _____
 b) In which country do you live now? _____

31. What is your ethnic group?

- a) Caucasian b) Asian c) African-American d) Aboriginal
 e) Other _____

32. Living arrangement:

- a) Alone b) In a couple c) With family d) With others

33. Where do you live?

- a) Home b) Assisted-living facility c) Nursing home d) Other _____

34. Level of education completed:
- a) Less than High school
 - b) High school or equivalent (such as GED)
 - c) Some College/CEGEP
 - d) 2-Year degree (associate, diploma)
 - e) 4-Year degree (BA, BS)
 - f) Professional designation (e.g., CA,CGA,CMA)
 - g) Master's Degree
 - h) Doctoral Degree (e.g., PhD, EdD, MD, JD)

35. Are you retired?
- a) Yes
 - b) No

36. Describe your working situation at the present time:
- a) Not working
 - b) Working part-time (paid or voluntary)
 - c) Working full-time (paid or voluntary)

(After pressing the submit button they will be taken to a thank you page and have the opportunity to enter the draw)

Thank you for completing this survey.

DRAW FOR \$50. If you wish to become eligible for the lucky draw of three \$50 cash prizes, please press on the link below to be linked to a separate SFU website to enter your contact information.

Appendix C.

Ethics Approval form



OFFICE OF RESEARCH ETHICS

Street Address
Simon Fraser University
Discovery 2
Room 230, 8900 Nelson Way
Burnaby, BC Canada V5A 4W9

Mailing Address
8888 University Drive
Discovery 2
Burnaby, BC Canada
V5A 1S6

Director 778.782.6593
Associate Director 778.782.9631
Manager 778.782.3447
FAX 778.782.6785

dore@sfu.ca
<http://www.sfu.ca/vp-research/ethics/>

Minimal Risk Approval

Study Number: 2012S0964

Study Title: Experiences and opinions of digital game play by older adults

Approval Date: 2013 January 21

Principal Investigator: Hausknecht, Simone

SFU Position: Graduate Student

Expiry Date: 2016 January 21

Supervisor: Kaufman, David

Faculty/Department: Education

Co-Investigators: none

Funding Source: none

Grant Title: N/A

Documents Approved in this Application:

- Study Detail, dated 2013 January 21
- Consent Form, dated 2013 January 21
- Sample Poster Wording, dated 2013 January 15
- Survey Questions

I am pleased to inform you that the above referenced study has been approved by the Associate Director, Office of Research Ethics, on behalf of the Research Ethics Board in accordance with University Policy R20.01 (<http://www.sfu.ca/policies/research/r20.01.htm>). The Board reviews and may amend decisions or subsequent amendments made independently by the Associate Director, Director, Chair or Deputy Chair at its regular monthly meeting.

The approval for this protocol expires on the **Expiry Date**, or the term of your appointment/employment/student registration at SFU, whichever comes first. **A progress report must be completed every year prior to the anniversary date of approval. Failure to submit an annual progress report will lead to your study being suspended and potentially terminated.** If you receive any grant for this protocol in addition to any funding listed above, please email dore@sfu.ca stating the funding source, the term of approval of the funding source and the title of that funding application if it differs from the title of your ethics application. If you intend to continue your protocol to collect data past the term of approval, you must contact the Office of Research Ethics at dore@sfu.ca and request an extension at least 6 weeks before the expiry date.

The Office of Research Ethics must be notified of any changes in the approved protocol. If you wish to revise your study in any way, please send an email requesting an amendment addressed to

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OFFICE OF RESEARCH ETHICS

dore@sfu.ca. In all email correspondence relating to this application, please reference the application number shown on this letter, which should be included in square brackets at the beginning of the Subject Line; this will ensure that all correspondence is saved to the electronic study file.

Your application has been categorized as “Minimal Risk”. “Minimal Risk” occurs when potential participants can reasonably be expected to regard the probability and magnitude of possible harms to be no greater than those encountered by the participant in those aspects of his or her everyday life that relate to the research. Please note that it is the responsibility of the researcher, or the responsibility of the Student Supervisor if the researcher is a graduate student or undergraduate student, to maintain written or other forms of documented consent for a period of 1 year after the research has been completed.

The REB assumes that investigators continuously review new information for findings that indicate a change should be made to the study protocol or consent documents and that such changes will be brought to the attention of the ORE in a timely manner.

If there is an adverse event, the principal investigator must notify the Office of Research Ethics within five (5) days. An Adverse Events Form is available electronically by contacting dore@sfu.ca.

All correspondence with regards to this application will be sent to your SFU email address.

Please notify the Office of Research Ethics at dore@sfu.ca once you have completed the data collection portion of your project so that we can close the file.

This Notification of Status is your official ethics approval documentation for this project. Please keep this document for reference purposes and acknowledge receipt of this Notification of Status by email to dore@sfu.ca and include the study number in square brackets as the first item in the Subject Line.

Sincerely,



Office of Research Ethics

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