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LET'S PLAY: UNDERSTANDING THE ROLE AND SIGNIFICANCE OF
DIGITAL GAMING IN OLD AGE

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Public Health
at the University of Kentucky

By
Julie Antoinette Skalsky Brown

Lexington, Kentucky

Director: Dr. Graham D. Rowles, Professor of Gerontology

Lexington, Kentucky

2014

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ABSTRACT OF DISSERTATION

LET'S PLAY: UNDERSTANDING THE ROLE AND SIGNIFICANCE OF DIGITAL GAMING IN OLD AGE

Despite a marked increase in the use of digital games among older persons, there is insufficient research that provides insight into the gaming experiences of this population. A major demographic shift within the senior gaming market has ushered in a new perspective on the use of digital games as a tool for physical and cognitive health, and improved socialization. It is proposed that individual notions of play, which are developed over the life course, influence digital game play engagement and interaction preferences, and contribute to well-being. This study explored how self-perceptions of play over the course of the senior gamer's life influence digital game engagement. Because the emerging area of senior gaming lacks theoretical structure, grounded theory methodology was employed. A qualitative study based on semi-structured interviews of aging gamers was conducted. A total of forty participants (age 44 to 77 with a digital gameplay average of 11 hours per week) were identified and interviewed with the aid of an interview guide. Designed with a life course perspective in mind, this guide sought to explore each participant's perception of play, personal forms of play throughout their life, and the role of digital games as a component of play in old age. Transcription and analysis (open, axial, and selective coding utilizing the method of constant comparisons) was employed throughout the entire interview process. Findings indicated that digital gaming is a valued form of play and a means for play continuity. An analysis of emergent themes led to the development of a theory that emphasizes three domains: ability, motivation, and experience. Two theoretical models that represent the static and dynamic nature of these domains within the life of a gamer demonstrate the theory. This theory provides understanding of the key factors that influence gameplay, which has the potential of being applied toward the development of better age- and ability-appropriate digital games for aging gamers.

KEYWORDS: Older Adults, Digital Games, Play,
Life Course, Grounded Theory

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LET'S PLAY: UNDERSTANDING THE ROLE AND SIGNIFICANCE OF
DIGITAL GAMING IN OLD AGE

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This dissertation is dedicated to my sister, Heidi, who taught me to laugh and enjoy life, and to those dearest to me with whom I have played on those many road trips, Friday afternoons or around a campfire. There is more fun to be had, so save me a seat...

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I could not have completed this without the support of my many participants. Their stories are not only woven into the pages of this dissertation, but also into my life as I move forward in the world of academia.

In addition, it is unlikely that this dissertation would have ever come to fruition if it were not for the wisdom and encouragement I received from friends and colleagues within the Graduate Center for Gerontology. In particular, I extend my sincerest gratitude to Dr. John F. Watkins who has made this journey truly enjoyable and forever memorable. I am also appreciative of Aasha Hoogland, who demonstrated herself as an exemplary friend with countless hours of laughter, listening, and feedback. It is because of these two that I still have some measure of sanity.

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Finally, I would like to thank my family. It is they who taught me the value of play and hard work, and fostered my love for exploration and learning. My Dad told me countless times during my youth that education was the greatest gift I could ever give myself. Let's hope he's right.

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PROLOGUE

In 2007 I witnessed something that altered the trajectory of my life. I was volunteering with activities at an assisted living community near my hometown of Prince George, Virginia. I had always wanted to do something with the older adult population, yet I had no idea what that *something* was, even when I was considering career options as an undergraduate student. In addition, I felt a growing sense of disconnect with this population; much of my youth was situated within a close-knit multi-generational family and I sensed that this sense of connection was waning.

At first, I aided with activities such as bingo, nail polishing, and weekly trivia quizzes, which I thoroughly enjoyed. After a few months, the activity director asked if I would be interested in setting up a Nintendo Wii video game system for the residents. She shared that she was hesitant to do so herself because she was not sure how it was to be assembled. I felt uneasy about her request as I had not owned and operated a gaming system since I was a child and, quite frankly, was intimidated by the sophisticated systems of the day. What I once knew as *video games* are now played on so many devices including computers and smartphones, that the term “video game” is no longer accurate. Due to the technological advancement in this field, the term “digital games” is now used to capture the broad array of games and gaming systems (known as ‘platforms’) used by contemporary consumers.

Despite my hesitation, I was handed a small armload of what seemed to be tangled cords, remotes, and a small, white plastic box. An odd mixture of panic and determination set in—feelings which would become all too familiar in the coming years in graduate school. I recall disassembling the tangled tentacles of this technological

beast, thinking there was *no way* that the residents would have any interest in this high-tech toy.

Initially, a few residents came into the room to take in the spectacle of assembling the device, something akin to the struggle between Ahab and Moby Dick. To my surprise, I conquered “the creature” and successfully connected the game system to the large television in the community activity room. I must admit that my fear of this modern machine was ultimately unjustified. With this, the Nintendo Wii gaming system became the newest oddity at the facility.

I recall the inaugural display of the first game, *Wii Bowling*. Although I was unsure as to how to operate the controls at that time, this did not deter residents from wanting to try as well. Sure, why not? I figured that it might be fun to learn together.

I was astonished with how interested the residents seemed to be and how quickly they picked up on the successful operation of the remote control (“Wiimote”). I provided some initial instructions and they began to provide suggestions with one another as to further operation of the game. Once they learned how to move their characters about and bowl their virtual ball down the lane, glances of wonder began to be exchanged among the residents. There was an overall sense of awe and cheerful excitement—an emotion that had previously been absent among this group of seniors.

I knew then that I had witnessed something important. How is it that this group of older adults was able to learn this new mode of technology so quickly? Why were they even interested in this “child’s toy”? Over the course of the following 16 months I witnessed countless hours of older adult residents playing with the Nintendo Wii gaming system. During that time, a regular play schedule was devised, teams were created to

play against residents at other similar facilities, alliances were formed, friendly “enemies” were made, and time outs were agreed upon for “drink breaks.” Never have I had so much fun with a group of older adults. I knew that I was privileged to witness something that I wanted to explore further. There was a growing need to understand this unique interaction; not just between the adults and the Wii, but the interaction that was taking place among the older adults while playing with the Wii.

It was clear to me that many residents thoroughly enjoyed playing the Wii games and that doing so influenced their quality of life. I recall the exasperated reactions of annoyance and disappointment when something occurred to hinder play, such as dead batteries within the Wiimotes. In addition, the residents expressed their frustration that they were not permitted to play unless I was there to supervise, suggesting that they were being treated as children by management. I agreed.

There was just something to this play outlet that seemed to enhance their emotional and social well-being, yet the contributing elements were a mystery to me. I was curious as to why these digital games seemed to provide a sense of joy. What was it about these games that made them want to play, and how was this interaction meaningful to them?

I noticed that there were technological and personal barriers to the digital game engagement of some of the players. For example, some had problems with manipulating the controls on the Wiimote due to the size and location of the buttons. Others had issues with the rapid response time required by some games. This prompted me to consider how the design of game platforms (hardware) and games (software) can promote *or* hinder the aging adult game player. This seemed important because I noted how these

games were not only a tool for emotional and social well-being among the residents, but also some of them confided in me that they considered the digital interaction to be a form of cognitive and physical exercise. Might it be possible that these games could be used to promote aspects of health?

With such questions in mind, I explored related research and found *very little* to support my inquiries. It was then that I began to feel a need to further explore how digital games might improve the lives of the older adults. This resulted in my development of a research program to support my quest to understand the growing phenomenon of “senior gaming.”

I joined the Graduate Center for Gerontology at the University of Kentucky in 2009. Although I initially encountered skepticism with respect to the value of research on senior gaming, I was encouraged to demonstrate the need for such research. As a result, I conducted a pilot project involving eight senior gamers during the summer of 2011, laying the foundation for my current research.

In the pages that follow, I share how over the next three years I went on to develop a research program on digital gaming that resulted in this dissertation. I begin by providing some background on the burgeoning field of senior gaming.

CHAPTER ONE: AN INTRODUCTION TO SENIOR GAMING

“Video games are bad for you? That’s what they said about rock-n-roll.”
– Shigeru Miyamoto, Creator of *Mario* and *Donkey Kong*

Senior Gaming

Games are a reflection of culture. Just as technology within our culture has evolved, so too, have games. The evolution of games is evident in today’s society when assessing the increased use of digital games and the composition of the gaming market. For example, it has been confirmed that older adults are using personal computers to play games (Bob De Schutter, 2011; Nimrod, 2011) and that digital gameplay via computers and mobile devices is increasing (ESA, 2007, 2011). As a result, an increase in the number of studies focusing upon older adult use of such devices for gameplay is anticipated, especially among the more technologically experienced Baby Boomers.

Despite the relative success of computers among the older population, a number of published studies note that digital games and gaming platforms (the system that is used to play the game) lack sensitivity to the diverse needs and preferences of older adults (Ijsselsteijn, Nap, Kort, & Poels, 2007; Nimrod, 2011). If digital games are to continue to be a source of play and to be of benefit to this unique market, game developers must take a number of aspects of the aging experience into account. This includes, but is not limited to, having a firm understanding of the normative and common pathological changes associated with aging, older adults’ health behaviors, older adults’ receptivity to technology, modes of technology use, and design factors.

Before such strides can be made, we must develop a foundational understanding of the influential factors that contribute to the growing popularity of digital gaming in old

age. Such insight would lend itself to identifying the underpinnings of a theoretical framework for senior gaming.

Specific Aims

This dissertation examines the significance of digital gaming within the lives of aging digital game players, “senior gamers.” To address this, the study addresses three specific aims:

- I.) To investigate how senior digital gameplay reflects a life course-related extension of the phenomenon of play into old age;
- II.) To investigate the role of functional ability in conditioning receptivity toward digital gameplay among senior gamers; and
- III.) To develop a theoretical perspective on digital gaming in old age.

This research will advance scholarship within the emerging area of senior digital gaming research by providing insight into and a theoretical framework for understanding the play practices, preferences, and perspectives of current senior gamers. Such understanding could provide the gerontological perspective that is largely missing from the design of digital games for this growing market, and ultimately, be a basis for the development of appropriate games and platforms for enhancing the quality of life among senior gamers.

Digital Games

To assess the role of digital games within the life of a senior gamer, digital games must be defined and reviewed within a historical context. This is significant because digital games are a reflection of the technological evolution of our society and play into the life course framework of this dissertation.

Although traditional forms of games, such as board games or sports, are still common, it is equally common to find games being played on computers and handheld devices, such as a mobile phone or tablet. Because there are multiple electronic devices to play these games, a term that captures this broad spectrum of this form of play is “digital games”. This includes video games (most are now known as home console games and are played on game systems such as Nintendo and Xbox), computer games, mobile games (e.g., games played on a smartphone) and all other games that are played on an electronic device.

A game platform refers to the game hardware that is used to play a digital game. In addition to some of the examples provided above, additional platforms include a laptop, iPod, and tablet. Sometimes multiple formats of a specific game are created for different platforms, whereas, others can only be played on a specific platform. For example, Nintendo’s *Wii Fit* games can only be played with the Nintendo Wii console, yet there are games that can be played on both the Nintendo Wii console and the handheld Nintendo DS (e.g., *Mario Kart*, a racing game). The amount and kind of physical interaction required with each game system are platform-specific. Thus, the physical movements needed to play a hand-held device differ from that of systems that encourage or require greater movement, such as the Nintendo Wii.

Historical Perspective on Digital Gaming

Since the introduction of digital games to the consumer market in the 1970s, gaming technology has advanced considerably, becoming a ubiquitous presence across a variety of platforms. Although considered primitive by today’s standards, the very first digital games were rather advanced for their time. *Noughts and Crosses*, a tic-tac-toe

game, was developed by A. S. Douglas at Cambridge in 1952 and is recognized as the first graphic computer game. A few years later in 1958, William Higinbotham introduced *Tennis for Two*, which ran on an oscilloscope at the Brookhaven National Laboratory. Like *Noughts and Crosses*, it was limited to the particular platform for which it was made.

By comparison, the next recognized computerized game, *Spacewar!* was considerably advanced due to its graphics. Massachusetts Institute of Technology students Stephen Russell, Martin Graetz, and Alan Kotok created the game in 1962. This game is noteworthy because it was the first to run on what we now know as a computer. However, it must be pointed out that early computers were monumental in size, taking up entire rooms, and yet did not have the processing power that is now found on today's average computer. By 1971, a smaller, self-contained version of *Spacewar! – Galaxy Game* – was created for public use. This game was made available at Stanford in the student union for 10 cents per play and remained there until 1979.

The first mass-marketed game was a console game system (played via a television screen) called the Magnavox Odyssey. This was forerunner for the today's console systems, such as the Sony PlayStation, Microsoft Xbox, and Nintendo Wii. In the same year that the Odyssey was released, 1972, Nolan Bushnell and Ted Dabney founded Atari, Inc. Atari is credited for much of the early success of arcades and home console systems into the mid-1980s with popular games such as *Pong* and *Pac-Man*.

The Golden Age of arcade games (1970s to the mid-1980s) introduced these new forms of play to the masses. Their popularity spurred widespread development of digital games, as many businesses began to enter this arena. This translated into the mass

production of low-quality games, which lost favor with the market. In addition, computers were gaining in popularity as an educational and entertainment tool within the home. Events such as these resulted in the Video Game Crash of 1984 and many of the gaming companies then in existence filed for bankruptcy (Nielson, Smith, & Tosca, 2008).

Although many companies went under in the early 1980s, Nintendo and its Nintendo Entertainment System (NES) emerged in this timeframe, buoyed by the success of games such as *Donkey Kong* (1981), *Mario Brothers* (1983), and *Super Mario Brothers* (1985) (Nielson, Smith & Tosca, 2008). Furthermore, Nintendo laid the foundation for the next evolution in gaming by producing high-quality digital games and is still regarded as one of the top game developers within the industry.

With the decline of arcades, home consoles and computers became the primary means by which individuals played video games. Advancements in digital game technology were also on the rise, as 3-D graphics and specialized soundcards became more common. In addition, the 1990s ushered in the use of the Internet as a means to access and play games. This created a means for social forms of gameplay; players were then able to connect with others to play without regard to geographical distance.

In subsequent years, technology would not only advance with respect to computers, but also with mobile technologies. Digital games are now found on mobile phones, iPods, electronic readers, and tablets. This is noteworthy because these games have become so compact, that they can now be taken and played just about anywhere. In addition, as these devices progressively decrease in size, there is the potential to hinder interaction with older persons who may find the size challenging to manipulate as a result

of having to operate closely placed buttons or read small-sized font. Although console games still command the majority of the digital game market, there is a trend toward the expansion of computer and mobile platforms for gameplay.

The Face of Gaming

Just as the platform for gameplay has changed over the years, so too have player demographics. There was a time when it would have been fairly accurate to envision the average game player as a teenage male. As evidenced in yearly reports of the digital game market, that is no longer the case. When Atari became popular in the early 1980s, a new game culture began to develop in the years that followed as digital games progressed. Many of the same young players that were introduced to games in arcades and later incorporated this form of play into their homes via the Magnavox and Atari consoles still play digital games today. Thus, it is no coincidence that the average gamer's age has progressively increased over the years; in 2011 the average gamer was 37 years old (ESA, 2011).

An entire generation has grown up with digital games as part of their lives, and subsequent generations are following in the same path. This does not mean that each member of these age cohorts has played, but simply that exposure to digital games has increased with each subsequent age cohort due to the increasing presence of games in modern society. Just as the average age of gamers increases each year, the age span of the demographic market is becoming more diverse as well. For example, digital games have been developed with particular age markets in mind, such as for toddlers, and have proved to be successful (Vandewater et al., 2007). LeapFrog has developed a series of digital educational games for children as young as two years of age that can be played on

a smartphone. It is now commonplace to find age-appropriate digital games for that population, usually for educational and developmental purposes, in toy aisles and online.

Age is not the only demographic characteristic that has changed over the years, as the player sex ratio has also shifted. Currently, females comprise about 47% of the gaming market (ESA, 2012). This is a 7% increase in less than 5 years (ESA, 2008) and may be attributed to a variety of factors, including an increase in the number of games targeted to the female population and an increase in the percentage of older users.

The earliest identified analysis of gamer demographic market trends dates from 1999 and was released by the Entertainment Software Industry (ESA). Beginning in 2005, ESA has released an annual report that provides demographic and sales data of the gaming market within the United States. When comparing gamer demographic data found in these published reports, it can be noted that the percentage of older users (identified in the reports as persons age 50 and above) has continually increased. In 1999, gamers aged 50+ constituted 9% of the market; within 12 years, this group would grow to capture 29% of the market. In contrast, the under-18 market steadily decreased up to the point of the 2011 market analysis. This indicates that there has been considerable shift in player characteristics. Although the 2012 market analysis is now available, the use of different age categories makes similar age cohort comparisons impossible.

The shift to an increasing percentage of older gamers may be attributed to several factors. First, there has been an increase in older populations' exposure to computer technologies. In comparison to older generations, the Baby Boomer generation (those born between 1946 and 1964) has been employed for a longer amount of time in

workplace environments that utilize computers, thus increasing their exposure to advanced technologies. It is a logical assumption that there is greater sense of familiarity and self-efficacy with respect to technology interaction among Baby Boomers as compared to their predecessors.

Another contributor to the increasing percentage of older gamers is the greater variety of games and gaming systems that better suit the playing needs and preferences of older players. The Nintendo Wii gaming system, introduced in 2006, facilitated this movement by introducing hardware components that are regarded as more intuitive to older users, as compared to previous systems. For example, its hand-held controller (Wiimote) resembles a television remote and the movement required for gameplay mimics similar gestures as those found in real life. So, when playing *Wii Golf*, the user would ideally grip the Wiimote in a similar fashion to a golf club and swing as if he or she were hitting a real golf ball.

Although there are now more digital game options for older players (See Table 1.1), this does not mean that current game options are sufficient. Market statistics provide evidence that the older player segment is increasing in size, and it is logical to infer that the majority of this market consists of Baby Boomers. This is due to reasons previously suggested, such as accessibility and exposure. This portion of the older player segment is more likely to have greater diversity with respect to game preferences (exposure) and, overall, has yet to experience the normative age-related impairments that inhibit interaction as compared to their older counterparts. This translates into the recognition of how this niche will continue to play their preferred digital games in the coming years as impairments increase.

Table 1.1 – Entertainment Software Association Market Report Data: Age Cohort Composition of the Gaming Market Per Year (2005-2011)

Year	Under 18	18 - 49	50+	Average Age
2005	35%	43%	19%	30
2006	31%	44%	25%	33
2007	28%	48%	24%	33
2008	25%	49%	26%	35
2009	25%	49%	26%	35
2010	25%	49%	26%	34
2011	18%	53%	29%	37

Note: Compiled by the Author. The data is derived from “ESA Essential Facts About the Computer and Video Game Industry,” Years 2005 – 2011.

This chapter provided an introductory summary of digital games and describes a demographic shift within the gaming market. Although Table 1.1 shows evidence that the proportion of aging game players is increasing, what do we know about this population? To shed light on senior gaming, we must first have an understanding of the building blocks that support the framework of senior gaming. The following chapter begins this journey by introducing the fundamental constructs of *play* and *games*, followed by supportive literature and research pertaining to senior gaming, applications of digital games to a senior market, and an overview of health-related aspects that may influence seniors’ digital gameplay.

CHAPTER TWO: BACKGROUND AND SIGNIFICANCE

To begin the exploration into the world of senior digital gamers, one must first have an understanding of the core components that comprise senior digital gaming. This chapter begins with an overview of the constructs of *play* and *games*. With each domain, I identify and describe associated characteristics, such as defining components, and provide a historical perspective. Next, I introduce the discipline of Game Studies and the use of research on motivation to provide a theoretical perspective toward digital gameplay. This is followed by an overview of studies that assess senior gamer characteristics (current gamers) and a growing area of research: rehabilitative uses of digital games for health promotion among older adults (potential gamers). To glean insight on the kind of elements that would need to be considered when designing for current and future gamers, an overview of normative aging is provided. This is of particular importance because it is critical to understand 1) how functional ability promotes or inhibits digital game interaction and 2) the age-related considerations that are to be taken into account in the development of ability-appropriate games.

Play

It is impossible for any reader of this dissertation to not have engaged in play at some point in his or her life. Play is a biological imperative exhibited in both persons and animals (Brown & Vaughan, 2009), and is regarded as a critical element for healthy development and personal growth in both childhood and adulthood (Son, Kerstetter, Yarnal, & Baker, 2007; Vygotsky, 2004; Yarnal, 2006; Yarnal, Chick, & Kerstetter, 2008). Additionally, play can be present at all stages across the lifespan (L'Abate, 2009),

yet there is a paucity of research that specifically examines play during older adulthood (Yarnal et al., 2008).

Play from a Life Course Perspective

A driving force behind this study is to gain an understanding of play throughout the life course and specifically, a unique form of play in the lives of older adults – digital gameplay. Life course involves “describing individual and collective experiences and statuses over long stretches of time and explaining the short-and long-range causes and consequences of these patterns” (Settersten, 2006). Life course incorporates more than static dates and socially constructed norms and expectations, as it takes into account the life span in full context (Watkins, 1999). It is the complexity and richness of this context that sheds understanding of the dynamic forces shaping individual lives. The factors that shape the life course are interwoven, but can be broadly categorized into domains including work and retirement, leisure, family, and health and illness (Settersten, 2006).

The domain of leisure, which is associated with play, is of particular note, as it is largely understudied yet will become increasingly important as the proportion of older adults continues to rise in the coming years (Settersten, 2006). Viewing play and digital gaming through a life course lens is critical as it allows one to understand how age-graded trajectories are influenced by life transitions (Elder, 1985, 1994). This may include how and why an aging adult adopted digital technologies into his or her life and the reasons that motivated their continued gameplay. For example, when considering the influence of school and work from a life course perspective of a senior gamer, we may be able to identify and understand the interplay of events and periods of stasis such as: the introduction to an early edition of a digital game while enrolled in college, the

reinforcement of gameplay (*Solitaire*, for instance) on the computer at work, and the desire to continue playing card-based digital games post-retirement. At the same time, the memory of these experiences are not devoid of other factors, such as family and health, but are intertwined and give texture to the lived experience.

In essence, to have an in-depth understanding of aging, one must have knowledge of the earlier years that shape the older adult's life course (Elder, 1994). In particular, there is interaction between experiences and personal interpretation of these experiences within the historical context of an individual's life. By examining play histories among senior gamers within this framework, there is a potential for themes and trends to be identified. These would provide rich insights into the life of digital gaming in old age and could ultimately aid in the design of games for this population.

To probe the complex phenomenon of “play” within a life course framework, an exploration of its meaning is warranted. Defining play is a challenge, as it is highly subjective and has been the topic of much debate among scholars.

A review of the literature indicated that there is no well-established definition of “play.” Words and phrases used to define play include “positive affect,” “flexibility,” and “intrinsically motivated” (Krasnor & Pepler, 1980). Indeed, some play theorists resist defining the word because there is so much ambiguity and subjectivity associated with the term.

Historical Perspective on *Play*

While a universal definition of “play” does not exist, Dutch historian Johan Huizinga, considered a pioneer in the development of play theory, was one of the first to formally explore the complexity and richness of this domain. In the seminal text, *Homo*

Ludens, Huizinga defined play as having the following characteristics: free activity, outside of ‘ordinary life,’ not serious but absorbs the player, no material interest or profit gained, fixed rules, and promotes social groupings (Huizinga, 1998).

Roger Caillois, a theorist on play and games, added to Huizinga’s postulates by proposing that play is voluntary, uncertain, unproductive, and has elements of make-believe (2001). Like Huizinga’s, this definition has been accepted by some and rejected by others. Yet a particular quality within his description that is worth noting is “make-believe.” This conveys that play involves an element of imagination, a psychological construct. Play is not restricted to physical activity, which is often an assumed product or manifestation of play. This is important to consider because physical ability typically declines with age. If it is assumed that play is *only* achieved when there is an element of physical interaction, then there is a decline in the amount of or ability to play as an adult ages. This in turn may affect quality of life for the aging individual.

The capacity for imagination is believed to increase with age and is considered *the* source for creativity which can be expressed in forms of play (Vygotsky, 2004). Indeed, this psychological construct merits recognition among older adults, as notions of make-believe are not customarily associated with this population. Similar concepts, such as fantasy and reminiscence, are recognized as an adult version or adaptation of imagination, yet are not necessarily considered as a form of play because they are usually void of physical expression. I propose that this is a critical aspect to explore among older adults. An older adult experiencing gradual age-related physical impairment may become more reliant upon cognitively-based forms of play.

Games

If asked to name a game, most persons would not have a problem naming at least one, if not several. Examples such as chess, baseball, and poker may come to mind. Yet if asked to define a game, this is likely to pose a greater challenge, as games are both socially and personally constructed, and vary tremendously with respect to rules and guidelines.

Exploring the essential characteristics of what constitutes a game is necessary in the examination of senior gaming because it is important to: 1) identify what an older adult may perceive as a game and 2) distinguish between play and games, as they may serve different purposes. Older adults may have different and evolving perceptions of what games are; such perceptions can be linked to life course changes. If these remain unrecognized, then their impact cannot be assessed within the context of the interpretation of digital gaming in old age.

Just as play, as viewed from a life course perspective, is a significant component of this dissertation study, so too are games. Play does not have to involve a game, yet in many instances, it does. For example, laughing children playing hopscotch on a school blacktop are engaged in a game and probably perceive it as play. Conversely, one can engage in a game, yet that individual may not feel that he or she is playing. For example, a person who plays a professional sport may participate in a game but regard their involvement not as play, but as a job. And, similar to play, a game does not have to be a physically expressed activity. Rather, an individual can cognitively construct a game and engage in it mentally. For example, a person can play an informal word or counting

game in their mind, yet exhibit no physical signs to show that they are doing so. Thus, play and games are distinct constructs, but they can be intertwined.

Although Huizinga focused on play, he was one of the first to bring attention to the identifying qualities of games by introducing “the magic circle,” a concept that is often attributed as a key element for game engagement (1998). The magic circle refers to a conceptual spatio-temporal realm in which the player exists, where a metaphorical barrier is crossed from reality to the world of the game. While within this circle, the player accepts the alternate reality of this world and abides by the rules within. Although the player alone experiences this, it may be witnessed when observing an individual who appears to be deeply engrossed within a game. For example, such individuals may appear to be intensely focused on the game and not distracted or detoured by elements of the real world. The notion of focus does not necessarily connote an element of seriousness, although it may. Rather, focus, in this circumstance alludes to a sense of mental immersion and can be expressed physically, such as through laughter or the display of excitement.

Huizinga’s ideology that the true experience of a game is confined within the “magic circle” has been challenged, as an argument can be made that its effects are transferrable to the real-world. Nielsen, Smith, and Tosca (2008) proposed some of these real-world consequences. First, it takes time to play a game. Time is a real construct regardless of whether or not it is of importance or of consequence within a game. Thus, when a person plays a game, they are taking time to do so, which brings into question what they might have been doing otherwise (e.g., reading, cooking, working, etc.)

Next, playing a game can affect a player's mood. Games can be engaging and prompt the player to levels of excitement, frustration, and/or satisfaction. There are numerous other emotions that can be evoked while playing a game, yet these effects do not necessarily end at the termination of a game. For example, the exhilaration after winning a hard-fought game is likely to continue for a period of time after the game and in some cases, the memory of that win can evoke a positive emotion, even years later.

Similarly, games can also affect one's behavior (Nielsen et al., 2008). The behavior can be reflective of the resulting emotion from playing the game, or it can prompt the player to take some form of action. For example, if a player feels strongly about a game, it may prompt him or her to learn more about it, socialize with others to discuss it, or even purchase products that may improve their performance (e.g., a new pair of soccer shoes or digital game accessories). Finally, games can communicate or prompt ideas. For example, a strategy learned within a game can be transferred to a real-world situation, such as seeking alternate methods for completing a task.

In addition to Huizinga's ideology, the magic circle concept alone does not provide a supporting framework of a game. Rather, his analysis of play spurred rigorous exploration to identify the defining elements of what constitutes a game. Caillois (2001) introduced a more focused perspective by positing that games are voluntary, uncertain, unproductive, and consist of make-believe. In addition, he was one of the first to formally provide structure to the classification of play within games by identifying four distinct categories: *agon*, *alea*, *mimicry*, and *ilinx*.

The driving characteristic for *agon* is competition, which utilizes strategy and skill and is central as to whether or not the player wins. Examples of this include chess

and many sport-based games. Another category, *alea*, emphasizes an element of chance; games that have a gambling quality, such as poker, typically fall within this category. Games that reflect *mimicry* do not emphasize winning as much as the previous two categories; rather, the basis of the game experience is “being” somebody else, such as taking on the role of a policeman or princess. Finally, *ilinx* is recognized in games that enable the player to experience a physical sensation. For example, this may be the motion felt by the driver in an automobile race.

Games can be placed into at least one of these categories, yet may share characteristics of more than one. For example, the game of poker reflects *agon* because it is a game of competition in which strategy is employed and *alea* because there is an element of chance in dealing cards.

Caillois also provided a framework for the role of play within games by introducing the constructs of *paidia* and *ludus*. A true *paidia* activity (or game) lacks formalized rules. On the other side of the spectrum are *ludus* activities and games that require rigid rules for play. A game does not have to fall into one of these two categories, but could be placed somewhere along the spectrum between the two. For example, the sport of boxing is somewhere between the two because although there are rules for the boxers to follow (*ludus*), their moves reflect independent, self-decided strategy (*paidia*).

In an effort to further formalize the constructs of a game, Avedon and Sutton-Smith proposed that a game consists of (or elicits) the following: an exercise of voluntary control systems, opposing forces, rules and procedures, and a disequilibrium outcome (1971). Furthermore, it is noteworthy that they recognized that a game is *subjective* in that it reflects arbitrary characteristics that are dependent upon the purpose. This means

that a game does not have to be formal, but created and/or identified by the player with intent in mind.

Game Studies

As computerized technology began to advance in the late twentieth century (see Chapter 1), games were adopted into this digital age and resulted in what we now know as digital games. The study of digital games – game studies – is now recognized as an academic discipline and “is moving from the periphery of scholarly inquiry to take a central position in how we study and theorize social life” (Boellstorff, 2008). As a new and evolving discipline it embraces multiple academic perspectives ranging from anthropology to education and computer science, but has yet to establish a common language or theoretical foundation.

Because there is a lack of theories that stem directly from game studies research, the application of extant theories is more common. In particular, attention to gameplay motivation is prevalent and has utilized theories such as self-determination theory (Ryan, Rigby, & Przybylski, 2006) and motivation-based taxonomies (Yee, 2006). Motivation means “to be moved to do something” (Ryan & Deci, 2000). With this in mind, two aspects to consider when assessing gameplay motivation is the *strength* of one’s motivation to play a digital game and the game player’s *orientation* of motivation – the underlying factors that prompt gameplay.

Motivation orientation refers to intrinsic and extrinsic factors (Ryan & Deci, 2000). In this context, intrinsic motivation refers to playing a game because it is inherently satisfying; external influences are not a factor. Extrinsic motivation refers to a separable outcome that is obtained when playing games. For example, an individual may

play as a means to spend time with somebody. In this instance, the game is not being played for enjoyment, but is a tool that meets a need that is not directly related to the digital game.

Gaming research that examines players tends to focus on younger populations, which is logical because there is a natural association between “play” and “youth.” Yet a gradual shift in player demographics is drawing attention to an older market – senior gamers. Little is known about this population in comparison to younger age gamers, and no unifying theory exists that relates directly to this dynamic segment of players.

Senior Gaming

Older adults have engaged in various forms of play and games throughout their lives, yet there is a select group among them who play digital games. As indicated in Table 1.1, the proportion of older persons playing digital games has increased by 10% in recent years (2005-2011). This may be attributed to a number of factors. The Nintendo Wii gaming system, and in particular the Wii Bowling game, is credited with increasing the popularity of digital games among the older adult market (Theng, Dahlan, Akmal, & Myint, 2009). The Wii system consists of a console, a wireless remote (controller or Wiimote), and a sensor. The Wiimote has an interface that is similar in design to today’s television remotes. Instead of a multi-buttoned controller requiring the use of two hands, the Wiimote permits the user to manipulate the device with one hand. In addition, this system allows the player to be interactive; the movement of the Wiimote determines the movement of the avatar (an on-screen representational character of the player) via sensor technology.

Although there are studies that assess the use of digital games for an older user, few analyze user characteristics and preferences. De Schutter and Vanden Abeele analyzed the meaning of digital game play within a sample of senior gamers (2008). One particular task requested the participants to list their passions. Games were not included on any of the submitted lists; rather, the lists included activities that allowed them to interact with a loved one. One might expect this to include intergenerational connectivity via computer or gaming technology. Also, participants were asked to share particular game concepts that they found appealing. Games that allow the player to connect with others (such as family members), cultivate their knowledge, and make a contribution to society were the most popular.

When an activity becomes more than a once-in-a-while hobby, it becomes a part of one's lifestyle and possibly a marker for one's identity. For instance, writing may be an enjoyable pastime for an individual, yet if it becomes a regular part of their life, the person may begin to recognize himself or herself as a writer. Or, an occupation may have become a part of one's identity even if the individual has not actively participated within that capacity for years, such as a retired teacher. An older adult may have begun an occupation early in their adult life and served in that capacity for as many as forty to fifty years. Serving in that role for so long is likely to influence or reinforce personal characteristics, such as an intrinsic need to help others, and will not likely diminish simply because they retire. That part of their identity may continue to exist into older adulthood, yet is relative to the individual.

Additionally, if an activity is technology-based, then age-related impairments may play a role as to whether or not one can continue the activity and will likely

influence the aging adult's quality of life. For example, a senior who develops severe arthritis in his or her hands may encounter technological barriers, such as interacting with computer and mobile phone interfaces. This may affect the adult's quality of life if he or she relies on these devices to maintain and nurture meaningful relationships.

Within the context of senior gaming, an older adult may have spent a career as a pilot and still identify himself or herself as such. A digital game that requires relatable skills (e.g. a flight simulation game) may be appealing, as it permits the senior to employ flight knowledge and, perhaps, reminisce. This perspective takes life course into account, as life events within a historical context are building blocks to that person's life and may signify a unifying characteristic among persons within the same age cohort. For example, the pilot referenced earlier may have served in World War II; this provides the potential for a richer perspective of his life and how that period of time continues to influence his aging experience. Engaging in activity, such as a flight simulation game, may enhance the older adult's quality of life by allowing him or her to re-experience a sense of satisfaction and in a sense, "re-live" a period of their life. A recent qualitative study considered this perspective and sought to identify older adult motivations and preferences with respect to digital game engagement (Nap, Kort, & IJsselsteijn, 2009). Most of the participants engaged in computerized card games as a means for fun, relaxation, passing the time, and/or the challenge of beating a high score. Also, most of the participants reported that they would enjoy playing games from their past, yet those games were not yet available as a digital game. Additionally, participants reported strong feelings of dislike for violent digital games.

Aversion to violent digital games was also reflected in a study by McKay & Maki (2010) when older adults were asked about their attitude toward shooting games. Respondents did not care for realistic shooting games due to the level of perceived violence involved. However, participants were willing to engage in shooting games if they were styled as a playful cartoon. Another study assessed gaming preferences, and included adolescents in addition to adults age 45 and above (B. De Schutter & Malliet, 2009). The game themes with the highest overall average score with respect to genre preference included racing, sports, and strategy games. With the findings in the previously mentioned McKay and Maki study in mind, it is interesting to note that adolescent boys preferred shooting games in the De Schutter & Malliet study. Additionally, it was found that women preferred classic, adventure and casual games. However, there was a unique split within adult men preferences: shooting, adventure, and casual games.

De Schutter (2011) found similar factors as Nap, de Kort, and IJsselsteijn (2009) when analyzing motivational factors for older adult engagement in digital games. However, De Schutter also included gamers as young as 45, the youngest of the Baby Boomer generation at the time of the study. He found that the highest rated motive was challenge, followed in sequence by arousal, diversion, fantasy, competition, and social interaction. Another study, by De Schutter and Vanden Abeele, sought to decipher the meanings and motivations that older adults attribute to digital gameplay (2010). Participants reported that playing was a fun way to compete with a partner (including intergenerational game play with grandchildren), an activity that could be done alone, a way to meet new people, and a sign of autonomy. Interestingly, it was also reported by

the participants that digital gaming is an activity that is sometimes looked down upon by similar-aged peers.

There has been an increase of studies that assess the use of digital games for improved health. Specifically, within the past few years there has been a surge in the number of studies that analyze game use among older adults for rehabilitative purposes. One of the earliest known studies that investigated older adults' use of digital games paved the way for their use as a means for health promotion and, in particular, for cognitive maintenance. This study tested reaction time among a control group (no digital game training) and a test group (digital game training) of older adults (Clark, Lanphear, & Riddick, 1987). The test group played either *Donkey Kong* or *Pac-Man* for a minimum of two hours a week for seven weeks. When comparing pre- and post-reaction time scores for both groups, it was found that there was a significant improvement among the test group. This study provided support for further research in the use of digital games as a means to improve reaction time among older adults. However, like many of the studies that would be conducted in the years to come, they assessed the games among older adults and not older adults who *actively* played digital games.

Digital Games and Rehabilitation

There is a dearth of literature that specifically examines senior gamers, but there is a growing literature base that assesses *potential* senior gamers. Considering the rehabilitative gains that may be afforded via use of gaming platforms, most of the studies that focus on older adults' use of digital games tend to have a rehabilitative emphasis. There has been a steady increase in the number of such studies, especially since the

release of Nintendo's Wii gaming system (Ackerman, Kanfer, & Calderwood, 2010; Agmon, Perry, Phelan, Demiris, & Nguyen, 2011; Bainbridge, Bevans, Keeley, & Oriel, 2011; Bell et al., 2011; Clark & Kraemer, 2009; Hsu et al., 2011; Hurkmans, Ribbers, Streur-Kranenburg, Stam, & van den Berg-Emons, 2011; Miller, Hayes, Dye, Johnson, & Meyers, 2011; Rosenberg et al., 2010; Saposnik et al., 2010; Williams, Soiza, Jenkinson, & Stewart, 2010; Yamada et al., 2011). It is reasonable to suggest that as potential benefits for rehabilitative gaming among the senior population continue to be identified, the volume of studies evaluating digital games as a practical tool for rehabilitative purposes will grow.

During the years 2011 and 2012, I charted the number of journal articles that assessed the older adult (age 60+) use of a digital game for rehabilitative purposes. The studies reviewed for this project had to be experimental with measurable outcomes and published within a journal (not conference proceedings). Three general categories resulted: cognition and emotional well-being (7 articles), balance and fall efficacy (8 articles), and stroke and motor impairment (10 articles). These articles are identified and discussed in subsequent sections.

Since then I have monitored the prevalence of these rehabilitative studies within peer-reviewed journals and have found that the number of articles has more than doubled. This suggests that there is a growing body of evidence that digital games can be more than just a source of entertainment. They represent a potential means to improve various health domains. This has considerable implications if this trend continues. This specific area of research lacks substance in that there is no cohesive foundational knowledge of 1)

what promotes adherence to rehabilitative digital games and 2) technology barriers and game preferences among aging cohorts.

One of the earliest known studies of rehabilitative gameplay among impaired older adults was published by Weisman (1983). Although the game technology used at that time is primitive by today's standards, Weisman demonstrated that games could be used by this population and had the potential to improve well-being.

Since that early study, investigations focusing on the use of digital games for health improvement among older adults have increased, particularly within the past decade. This is in part due to the introduction of Nintendo's Wii game system and *Wii Fit* in 2006. Reflecting a more intuitive and simplistic hardware design, this system has been found to be more accommodating to non-traditional players than previous game systems. Furthermore, the Wii digital games require physical movement on the part of the player and are reflected on the game display in the form of an avatar. These features are believed to be catalysts to Wii's relative success among older adults for rehabilitative purposes.

Therapy via digital gaming is gaining in popularity for three distinct reasons: cost, portability, and motivation (Clark et al., 2010; Rand, Kizony, & Weiss, 2008). With costs that can run as much as several thousand dollars, some technological rehabilitative equipment, such as a force plate (used to measure balance), is considerably more expensive than accessories for current home console systems (Young, Ferguson, Brault, & Craig, 2011). An example is Nintendo's Wii Balance Board (WBB). This cost-effective option allows a more feasible rehabilitative option, particularly for in-home therapy. In addition, because digital games can be so engaging, users tend to be

more motivated to play, which is a key component to successful rehabilitation (Agmon et al., 2011).

Although Nintendo's Wii system is the most popular platform choice among rehabilitative gaming studies, Sony's EyeToy has also been used and evaluated. The EyeToy is similar to the Wii in that it is also a home console-based accessory with a handheld device that enables users to operate within the game much in the same way as one would with a Wiimote (i.e., sensor technology).

Rehabilitative gaming studies that assess use among older adult participants (age 60 and above) typically fall within one of three broad categories previously mentioned: studies of cognition and emotional well-being, balance and fall efficacy, and stroke and motor impairment.

Cognition and Emotional Well-Being

Cognitive decline is a concern for many aging persons. In particular, improved cognition is a key area of focus within rehabilitative interventions, as cognition can become further compromised due to health-related impairments. Additionally, emotional well-being has become recognized as a critical factor to assess and facilitate among older adults. The following studies evaluated the extent to which use of particular digital games could produce positive cognitive or emotional outcomes.

Ackerman et al. (2010) and Basak et al. (2008) assessed whether or not digital gameplay would be a catalyst for the transfer of cognitive skills to another measurable outcome. Ackerman et al. had participants play Wii's *Big Brain Academy* and found statistical significance with respect to task-specific improvement, but there was no appreciable transfer to ability tests. In contrast, Basak et al., found a significant transfer

effect from gameplay on the computer game, *Rise of Nations - Gold Edition*. In addition, there was improved performance on most executive control tasks and a mental rotation task. This is important because executive control is linked to frontal lobe functions such as high-level cognition.

A related study focused on different cognitive mechanisms associated with fluid intelligence, working memory and information processing by engaging participants in a “brain game” (*Dr. Kawashima's Brain Training*, for the Nintendo DS platform) (Brem et al., 2010). Based on the premise that cognitive ability declines during prolonged hospitalization, the authors found significant improvement in both working memory capacity and rate of information processing among the hospitalized patients in the treatment group. Also, there was evidence of increased memory span, although this finding did not reach statistical significance. This approach merits further research, as it has potential therapeutic implications for hospitalized older adults as well as those who are mobility-challenged, but still reside within their homes.

Two particular studies assessed the following outcomes: improved reaction time, improved cognition (or adaptability), and improved emotional well-being (Dustman, Emmerson, Steinhaus, Shearer, & Dustman, 1992; Goldstein et al., 1997). The studies used very different game systems (Atari and Nintendo Super NES), yet obtained similar results. This is noteworthy, as these two systems are very different with respect to interface and interaction requirements. The NES has a more complicated controller with multiple buttons, thus placing greater demands upon working memory for novice users. For both, the reaction time, a product of both cognitive and motor processes, improved significantly, whereas the other two measurements did not. Although the positive

findings are encouraging, low scores for emotional well-being may indicate a lack of motivation—a key factor for the initiation of gameplay. Thus, it may be that if the older adult does not perceive a potential for emotional gratification, he/she may not engage in a game.

Another study also assessed emotional reward for gameplay among impaired older adults and, like the two aforementioned studies, there was no significant improvement with that outcome measure (Riddick, Drogin, & Spector, 1987). However, qualitative feedback gave another impression. As novice users of digital games, many of the participants experienced frustration while playing Atari's *Pac-Man* and *Donkey Kong*. In contrast, they also expressed enjoyment with the activity, which motivated them to play more. In fact, one commented that she was looking forward to playing with her grandchildren.

A final study in this category measured depressive symptoms, health-related quality of life, and cognitive functioning among older adult participants diagnosed with subsyndromal depression (Rosenberg et al., 2010). The treatment group played an assortment of Wii games and showed evidence of significant improvement with each outcome measurement. Only speculative reasons can be offered for such encouraging results when insignificant findings have emerged in similar studies (Dustman et al., 1992; Goldstein et al., 1997; Riddick et al., 1987); it can be suggested that the reason may be attributed to the ease of interaction with the platform implemented in each. Earlier studies used game systems and games that were not yet designed for the novice player. This may have limited the potential for a more positive and non-frustrating gameplay experience.

Overall, the therapeutic interventions implemented within these studies yielded beneficial results, particularly those that utilized a newer game platform and targeted specific cognitive processes such as executive control. However, for there to be valid gains within this distinct area of rehabilitative gaming, there must be an effort to develop a sense of cohesion with respect to outcomes measured, tests used, participant characteristics, and platform/game implementation.

Balance and Fall Efficacy

Falls are common among older adults. Indeed, one out of every three falls each year (Hausdorff, Rios, & Edelberg, 2001). Such falls are the leading cause of injury-related death among older adults and are the most common cause of nonfatal injury (Hornbrook et al., 1994). With this in mind, it is no surprise that interventions for improving balance and fall efficacy are a core area of focus within rehabilitative therapies for older adults. Because some newer digital game systems, such as the Nintendo Wii and its accompanying balance board, are designed to incorporate balance-related aspects within some games, numerous studies have been conducted to evaluate older adults' use of these technologies as a means for rehabilitative intervention.

Most studies within this category measure improved balance as the primary outcome, followed by studies that measure fall efficacy. Studies specifically targeted static and dynamic balance (Gil-Gomez, Llorens, Alcaniz, & Colomer, 2011), or specifically dynamic balance (Miller et al., 2011). In all balance measurements, there was improvement despite the differing characteristics of the participants.

A study conducted by Gil-Gomez and colleagues focused on a sample of participants with Acquired Brain Injury (ABI) with ages ranging from 27 to 70. Instead

of using Wii Fit and WBB as treatment, which is common in balance studies, a game program was developed (eBaViR) to use *with* the WBB platform. This was an attempt to make a more accommodating and rehabilitative game for those with ABI.

By comparison, the Miller study also used the WBB but assessed balance via the use of a commercially available game (*Wii Fit*). This study measured the outcomes of two persons who had a transfemoral amputation and now rely upon a prosthesis. Only one participant was classified as an “older adult” and he indicated improvement on all balance measures.

The remaining studies that assessed balance utilized older adult participants who were either classified as “healthy” (Dougherty, Kancel, Ramar, Meacham, & Derrington, 2011; Lamoth, Caljouw, & Postema, 2011; Yamada et al., 2011), or had a specific balance issue or a history of falling (Agmon et al., 2011; Bainbridge et al., 2011; Clark & Kraemer, 2009; Williams et al., 2010). All outcomes that measured balance showed evidence of improvement. Only the studies conducted by Dougherty et al. (2011) (which utilized *Indo Balance Trainer*) and Williams et al. (2010) (*Wii Fit* and WBB with assorted games) demonstrated statistical significance. However, there are notable weaknesses within the former because it utilized features of the *Wii Fit* program when the treatment was designed to assess a non-Wii balance platform. Thus, it was impossible to distinguish if the effects were attributable to the non-commercial game system or *Wii Fit*. Information was not provided about the games or features of the rehabilitative gameplay.

Other salient outcomes of balance studies include the findings of a study performed by Bainbridge et al. (2011). This study utilized the *Wii Fit* and WBB as an intervention among community-dwelling older adults with a perceived balance deficit. In

addition to improved balance among the treatment participants, gameplay influenced their confidence with respect to balance and enhanced limits of stability. Stability confidence is critical in older adults, as the fear of falling actually increases the likelihood of falling.

A related study examined fall efficacy as a rehabilitative outcome (Bell et al., 2011). The treatment consisted of using the Wii system and the game, *Wii Bowling*. Although treatment did not improve fall efficacy or other statistical measures, such as quality of life and social connectivity, this finding may be attributable to the low number of participants that received treatment (a total of 14 participants). The quantitative results did not show evidence of benefit, but qualitative findings demonstrated otherwise. Participants in the treatment group exhibited behavior that indicated enjoyment and socialization. In addition, some verbal responses validated this observation; one participant even commented upon the reminiscent value of the game, such as enjoying the days when he/she used to bowl. It may be suggested that reminiscence was a motive for gameplay.

Stroke and Motor Impairment

A final area of rehabilitative gaming research among older adults pertains to stroke and motor impairment. Most of the older adults that participated in these stroke and motor impairment studies had some degree of impairment with upper extremity function. One study focused specifically on motor impairment of the fingers and hand of an older adult that had not experienced a stroke (Szturm, Peters, Otto, Kapadia, & Desai, 2008). However, most of the other studies consisted of persons that experienced a stroke.

Two studies measured overall physical functioning and yielded positive results (Flynn, Palma, & Bender, 2007; Hsu et al., 2011). Although treatment participants reported improvement, the two studies were quite different. Flynn et al. performed a case study on a post-stroke older adult as a means to see if the Sony PlayStation EyeToy, along with 15 EyeToy-compatible games, was feasible for use within the adult's home. A part of this was determined by performance outcome. The other study (Hsu et al., 2011) observed long-term care patients with upper-extremity (shoulder) weakness that had not experienced a stroke. The results indicated improvement in most functional ability tests, as well as improved performance with the impaired shoulder. Additionally, it was found that the treatment group did not experience any decrease in pain, yet they enjoyed playing *Wii Bowling*.

Four of the identified studies assessed general upper extremity function (Broeren, Claesson, Goude, Rydmark, & Sunnerhagen, 2008; Saposnik et al., 2010; Yavuzer, Senel, Atay, & Stam, 2008; Yong Joo et al., 2010). Broeren et al. examined the feasibility of a newly designed platform that demonstrated haptic technology, which affords tactile feedback (e.g., vibrations), among post-stroke older adults at an activity center. Although, the results did not indicate a significant transfer of skill to everyday functioning, the non-commercial platform implemented was found to be a feasible therapeutic tool within a non-hospital environment.

Studies performed by Saposnik et al. (2010), Yavuzer et al. (2008), and Yong Joo et al. (2010) yielded similar results that indicated improved functioning of the upper-extremity. Unfortunately, none of the tests administered to participants were the same, so comparison is limited. However, two of the studies implemented the Wii game system

and an assortment of games that are a part of the *Wii Sports* package (Saposnik et al., 2010; Yong Joo et al., 2010). The other study implemented the Sony PlayStation EyeToy as the treatment (Yavuzer et al., 2008).

Overall, the findings from the studies in the three domains reviewed were promising, even if many of them did not yield statistically significant results. The vast majority of the outcome measures provided evidence of rehabilitative improvement, many with clinical significance. Going forward, attention must be given to functional abilities in relation to the platform and games, as well as the motivation that may encourage participants to adhere to treatment. With this in mind, it is critical to understand the key age-related abilities, and their thresholds, that are required to interact with digital games. Failure to meet these needs can pose an unnecessary barrier for older adults' digital interactions.

Age-Related Functional Abilities within a Digital Gaming Context

Despite the growing amount of literature that explores rehabilitative gaming, there is a lack of literature that considers functional ability in relation to digital game design. Although the studies reviewed thus far are informative and, in some cases, promising in terms of rehabilitative goals, there seems to be a common theme among most of them in that there is a disconnect between the technology and older users. This can ultimately be traced back to the original sources of these platforms and games: the designers of these technologies and their understanding (or lack thereof) of aging adults.

To narrow the gap between designers and older adult end-users, there must be an understanding of the physical and cognitive mechanisms involved when interacting with digital games and, specifically, how these change with age. Older populations are

incredibly diverse with respect to individual functionality, so this poses a considerable challenge to designers of technology. To shed light on this, the following sections introduce specific normative changes that typically occur among aging individuals and how declining abilities may affect their interaction with a digital game.

Vision

It can be argued that vision is the most important of the senses needed to successfully interact with most game environments. Because various aspects related to vision begin to decline in later adulthood, there are a number of adjustments that should be taken into account when designing a game.

Visual acuity. One of the more prominent age-related declines is *visual acuity*. This refers to the sharpness of a visual image and typically begins to decline around age 40 to 45 (DiGiovanna, 1994). When this occurs, accuracy in visual discrimination is affected and the adult is less able to distinguish fine lines and details. Also, colors with short wavelengths (violet, blue, and green) become more difficult to distinguish. As acuity continues to decline, so too, does the ability to perceive movement.

With respect to game interactions for a person with impaired visual acuity, it may be difficult to identify game elements, such as text, characters, scores, and details within the game environment. Thus, it may be beneficial for elements within the virtual environment to be clearly distinguishable from one another via contrasting colors and to limit the use of short wavelength colors (Fisk, Rogers, Charness, Czaja, & Sharit, 2004). Furthermore, it would be beneficial if the environments within a game were categorized with respect to level of difficulty and visual ambiguity. This refers to games in which the environment becomes increasingly “cluttered,” thereby making it more difficult to spot

the target (Yamani & McCarley, 2011). This not only serves as a way to incorporate challenge within a game, but to also make the game adaptable to users' needs.

Impaired visual acuity may also cause problems when identifying and reading text within the game. For example, a query system could be available to the user, yet if he/she is unable to read the text it becomes useless. Therefore, if the software cannot accommodate the user via an adaptive program, then an option early in the program that allows the player to select font size may be advantageous. By doing so, this would indicate the need to make characteristics more salient, such as landmarks and targets within the game.

Large-print text within a digital environment should be sans serif, e.g., Arial and Helvetica, and not be in all caps (Ellis & Kurniawan, 2000). In addition, "dead space" around the text is accommodating to declining visual acuity. This means that the text should not overlay a busy background. Rather, there should be a large contrast ratio with corresponding dark to light text and background (Fisk et al., 2004).

Finally, with respect to visual acuity, the motion within a game should be considered. Any movement made by game elements, such as a car that drives by or a moving puzzle piece, should do so at a speed that limits the potential to produce an afterimage. Similarly, less noticeable movement should not be so slow that its movement is not detected (Fisk et al., 2004).

Contrast sensitivity. *Contrast sensitivity* is another visual function that tends to decline as a function of advanced age. Contrast sensitivity relates to some of the concepts and design suggestions presented for visual acuity, yet is distinct as it speaks directly to how well an individual can distinguish between the light and dark elements of

an image (Long & Zavod, 2002). Additionally, visual acuity is often regarded as more important than contrast sensitivity, but this is not an accurate inference in many instances. Rather, when it comes to performing daily tasks, such as reading and driving, contrast sensitivity is more critical. For example, an older adult may find the text within a game to be distorted; yet, this would be a worse situation if there were low contrast between colors. This applies to other aspects within the game environment as well, where low contrast may make it more difficult for players to distinguish elements within the play environment.

Contrast sensitivity can be enhanced by considerations such as those previously reviewed. For example, it has already been suggested that increasing the dark/light ratio of the text and text background can emphasize sensitivity, as can decreasing the visual clutter around the text (Yamani & McCarley, 2011). Furthermore, ensuring adequate spacing between the letters and the lines of the text would help distinguish characters within the text (Pak & McLaughlin, 2011).

Designers cannot control the illumination of a player's physical environment, but they do have input regarding the brightness levels of the virtual environment. As vision declines with age, older adults tend to require more light to see adequately (Owens, Wood, & Owens, 2007). In addition, glare becomes an issue for many older persons due to low illumination, but is more likely to happen under conditions that are within their controlled immediate environment (Shinar & Schieber, 1991).

Visual search. Another age-related impairment to take into consideration for a game relates to *visual search*, which is a critical task for many digital games, such as card games and puzzles. Visual search calls upon an older adult's ability to use attentional

focus to search for something specific (Maltz & Shinar, 1999). Specifically, purposeful search tends to decline with age because of the serial nature of the task. Furthermore, a greater challenge is posed as the number of game elements increase. This also relates to the strength of an older adult's attention (reviewed later).

To accommodate for this, unnecessary features should be eliminated, or at least be an adaptable option. This could be an additional option that is adjustable when the player selects text size at the beginning of the game. Also, if particular elements are positioned within the virtual environment that require attention, salience would need to be increased.

Another option within a game would be to have an adaptive feature that times how long it takes to identify targets (game elements). If it takes longer than is calculated as the average time for that level, then the program can provide cues to the player. For example, the contrast of the target can be increased or an appropriately designed text box can appear to provide large print-sized hints with an audio option that would familiarize the player with the environment.

Field of view. *Field of view (FOV)* is another visual consideration for game design although this is generally not as critical as the issues previously reviewed due to the sometimes limited size of the display (DiGiovanna, 1994). FOV in this discussion is in reference to age-related impairment, not to aspects of *field of reference*, as described in the following paragraph. Although not always a limitation within a game, this may influence the effectiveness of cues that appear within the periphery of older person. Thus, nonessential elements should be limited or eliminated because they may either be a distraction or not noticed at all, depending upon the size of the visual field.

Cognitive Mechanisms

Cognition is a critical element in game engagement. Aspects of memory and intelligence are associated with age-related decline and can heavily influence one's ability to learn *how* to interact with a game system and remain engaged. Stated broadly, intelligence can be separated into two categories: *crystallized intelligence (Gc)* and *fluid intelligence (Gf)*.

Crystallized intelligence (Gc). Gc refers to cognitive skills that have been learned and is utilized when drawing upon knowledge that is collected over a lifetime (Pak & McLaughlin, 2011). Gc tends to remain stable over time (and may even improve in certain circumstances) and is utilized in problem-solving when confronted with unfamiliar situations. *Semantic memory*, regarded as the storehouse for acquired knowledge, is associated with Gc and its strength does not usually decline with age (Fisk & Rogers, 1997).

Gc and forms of reliable (or fairly stable) memory, such as semantic memory, should be capitalized upon within the design of a game that targets older populations. Two products of Gc that should be taken advantage of include *verbal ability* and *mental models*. With respect to verbal ability, it is important that game designers do not use words or phrases that would be unfamiliar to the older generations. Also, designers should be more mindful of designing environments and elements within a game in accordance to what is likely embedded within an older adult's mental model. For example, for most card games, it would be logical if the face of the cards looked like traditional playing cards.

Fluid intelligence (Gf). On the other side of the intelligence spectrum is fluid intelligence – *Gf*. These are the cognitive skills that are required to process novel situations and facilitate learning (DiGiovanna, 1994). Unfortunately, *Gf* does not remain as stable as *Gc* as an adult ages. The rate and extent to which *Gf* declines varies among individuals. In addition, there are multiple cognitive mechanisms that decline with age and in effect, may also influence other capabilities beyond cognition. The situation becomes increasingly complex when considering the decline of neural function. Neural function not only plays a significant role within cognitive processes, but also sensory regulation. As a result, accommodating for these impairments becomes more of a challenge.

Cognitive aging. Cognitive mechanisms that are noted for declining with age include perceptual speed, working memory capacity, attention, and spatial ability. *Perceptual speed* refers to the rate that a stimulus can be perceived and processed (Morrow, Leirer, Carver, & Tanke, 1998). This is not a factor in all games, yet is certainly worth consideration within a context that incorporates movement and time restrictions.

Working memory is significant for a person learning new information as it is dependent upon his/her ability to retain information while working on something else (Sharit, Czaja, Nair, & Lee, 2003). To help accommodate for this type of memory within a game, the use of prompts can be employed. In this situation, the goal for the designer would be to create environmental support by devising symbols that would be representative of something the older adult could infer by utilizing their *Gc*.

As previously mentioned, declines in *attention* can make it difficult to focus on necessary displays and process multiple modes of information (Sharit et al., 2003). Balancing selective and divided attention can be a chore for an older adult because their cognitive resources typically become reduced with age. This can make it difficult to notice needed information and, at the same time, make it challenging to understand the information presented (this taxes working memory as well). In addition, the shifting of information can take additional time for an older adult.

Sensory Systems

Another critical element regarding game engagement involves the *neuromuscular system* and other sensory systems, such as the somatosensory. In particular, I will review the importance of the *Central Nervous System (CNS)* and the *Peripheral Nervous System (PNS)* as a function for *motor control*. In short, neural impulses (the “messengers” within a body) decrease with age (Salthouse, 1985). These are essential because they are *how* the CNS and PNS communicate. The CNS consists of the brain and spinal cord, whereas the PNS consists of the rest of the nerves in the body. Sensory receptors detect changes in the environment and send a signal to the CNS for it to be interpreted. The CNS sends a signal back regarding how to react and muscle movement in response to the stimulus occurs if warranted. The neurons within the CNS, *motor neurons*, influence involuntary muscle movements (autonomic) or voluntary muscle movement.

Fine motor control. Because neural impulses decline with age, the CNS and PNS cannot communicate as effectively (DiGiovanna, 1994). Therefore, the ability of the older person to sense and respond to stimuli declines. This becomes more pronounced with *fine motor control* movement, such as clicking a computer’s mouse.

Some computers can be adjusted to help offset this impairment; for example, by adjusting mouse sensitivity. However, if the older adult is unaware of this option or does not have the knowledge to address it, this becomes a moot point.

Response time. A key feature of motor control is *response time*, which is comprised of reaction time and movement time (Stelmach & Nahom, 1992); it should also be noted that response time is not exclusive to motor control, as it also works in conjunction with cognitive processes. This can be related to an older adult player by considering the time needed to notice a stimulus within a game and the time needed to respond to that stimulus. A delayed response time is not a critical issue in all games, yet could be factored in if the game is programmed to monitor the amount of time it takes the user to respond. If time is a factor within a game, then a general rule of thumb is that an older adult should be allotted 50% more time to complete a task than somebody under the age of 30 (Pak & McLaughlin, 2011).

Accuracy. Poor motor control also affects *accuracy* (Pak & McLaughlin, 2011). Although this does not decline as much with age, any declines in accuracy are often accounted for by increasing the amount of time needed for the task. For example, an older adult may use a mouse (an indirect input device) to manipulate features of the game, yet there would be greater accuracy if a direct input device, such as a finger or stylus, were used. This is often at the cost of speed (response time) (Stelmach & Nahom, 1992). Thus, if an indirect device is required for the game, the size of a target and its relative location should be considered.

Another accommodation would be to increase the “stickiness” of game elements that need to be “clicked.” Alternatively, a “force field” can be enabled around targets

that require manipulation. This helps draw the indirect device symbol, such as a cursor displayed on a computer screen, to the target area. A final consideration that involves both accuracy and response time is gain – the movement distance of an indirect object in relation to what is moved on the screen. If applicable, it would be beneficial if the game were designed as adaptive because this is another feature that could be automatically adjusted for greater accuracy. Increasing the gain though, also means an increase in movement on behalf of the player (i.e., greater motor control). One of the compromises to doing this would be a decrease in the distance that, for example, an avatar would be able to move within a set visual field.

Somatosensory system. Another sensory feature to consider is the *somatosensory system*. Sensory and motor neurons are essential for noticing and responding to stimuli (DiGiovanna, 1994), which plays a role in sensing the input device for the game and therefore affects gameplay. This is because they are pronounced on areas of the hand and fingertips. Decrease in tactile sensitivity also makes it difficult to identify the exact location of the touch and affects reasoning on the shape of the object, such as the input device for the game.

Although few accommodations can be made for this, a game program can be designed to avoid discriminating among various buttons on the device when an action within the game is expected. For example, a game that was designed to be played on a computer with a mouse could be designed to avoid discriminating between the left and the right click of the mouse. If the input device afforded feedback, this could be provided via tactile or haptic features. The implementation of various modes of feedback within the game should not be underestimated (*or overused*), within the design of the game.

Summary

When considering the array of topics presented within this chapter, senior gaming can be viewed along a line or continuum. This continuum begins with play, a biologically and socially influenced construct, and extends to understanding how functional ability influences an extension of a specific form of play (digital gaming) into old age. A review of the literature reveals that the constructs of play and games have received critical attention over the years, but to a lesser extent is the assessment of these within the context of aging of technology. We are familiar with biological mechanisms associated with aging and their influence on the aging experience, yet how these age-related changes influence digital game interaction deserves increased attention. In addition, as highlighted in the rehabilitative research, there remains a need to better understand the contributing elements that both hinder and promote gameplay for therapeutic purposes. Although there is mounting research within game studies, there is a lack of game-originated theory, especially from an aging perspective. Such a theoretical framework would provide insight to better accommodate the needs of aging gamers, whether it is for intrinsic purposes or for achieving rehabilitative goals.

The literature reviewed here laid the groundwork for approaching and conducting my studies that focused on the aging gamer. The following chapter introduces how, through a pilot study, I gained insight on perceptions of play, game, and digital games among senior gamers within a life course framework. This provided the necessary foundation to initiating the main dissertation study.

CHAPTER THREE: PILOT RESEARCH AND STUDY DESIGN

Content within the previous chapters served as a foundation to my initial examination of the senior digital gaming culture, which resulted in a pilot study and ultimately the research for this dissertation. This chapter provides an overview of the pilot study and a description of the research design for the dissertation.

Pilot Study

A pilot study, *Perceived Meaning and Experiences of Personal Video Game Use Among Older Users* (University of Kentucky IRB #11-0411-P4S), was conducted to explore and identify themes within senior digital gameplay. Because little is known about the characteristics of this population, grounded theory methodology was employed (Charmaz, 2006; Corbin & Strauss, 1990; Glaser & Strauss, 1967). The goal of this approach was to assess senior gamers' perceptions and incorporation of play, games, and digital games within their life and establish a preliminary framework for theory development.

Methods

Recruitment and inclusion criteria. Participants for the study were recruited via referral (snowball sampling). Recruitment began with one participant who then contacted and provided my contact information to other potential participants. Interested persons contacted me by telephone and I shared information about the study and inclusion criteria. Inclusion criteria for the participants included the following: must be age 50 or above, be in at least fair health (self-reported), engage in digital gameplay at least two times a month for a minimum of one hour, and be able to provide informed consent. Potential participants were made aware that their involvement was voluntary

and that all interviews would be digitally recorded for transcription and subsequent analysis. A mutually agreeable meeting time and location for the study interview was selected if a candidate was found eligible and gave consent.

The interview process. When meeting with each participant for the formal interview, I reviewed the purpose of the study and interview process. An interview guide created specifically for this study was referred to throughout each interview. This guide consisted of six sections: (1) *rapport establishment*, (2) *play*, (3) *games*, (4) *digital games*, (5) *a closure question*, and (6) *demographic information*. The purpose of the first section was to establish rapport and acquire a general timeline of the notable events within each participant's personal history, including those related to family and career. The *play* section of questions was created to identify the participant's definition, perception, and role of "play" throughout his or her life. For example, participants were asked how they would define "play," and to describe ways that they participated or were discouraged from engaging in play at different points during their life. Questions asked in the *game* section were similar in structure to the *play* questions, yet the participant was also asked to distinguish between the two concepts. The *digital games* section was similar to the previous two sections in that it focused on assessing each participant's perception of and participation in digital gameplay. This section placed greater emphasis upon the perceived benefits and barriers to engagement in this unique form of play.

Transcription and coding. All interviews were transcribed verbatim into a Microsoft Word program. Only information that compromised anonymity was excluded from individual transcripts. Open coding was used to identify general categories of information (Charmaz, 2006; Corbin & Strauss, 1990). These categories, along with

supporting text, were then organized within an Excel spreadsheet to compare similar-themed responses among the participants using axial coding. Further analysis employed selective coding to explore potential relationships among the categories and produce broad overriding themes in the data.

Findings and Discussion

The seven participants (5 female) ranged in age from 61 to 91 (Table 3.1). All live in a rural or suburban area in central Virginia, and all but one interview took place in the participant’s residence. One interview was conducted at the participant’s private office at her place of business.

Table 3.1 – Pilot Study Participant Characteristics

Name	Age	Sex	Platform Preference
Bob	91	M	Console
Jim	88	M	Console
Bonnie	82	F	Computer
Nancy	79	F	Console
Sandra	67	F	Computer
Eileen	67	F	Computer
Janie	61	F	Computer

Three dominant themes emerged from the data and provided an initial understanding of the factors that influence digital gameplay in old age: first exposure to digital games, platform preference, and the role of reminiscence.

First exposure. There was indication of an association between the age of the participant and their first exposure to (or engagement with) digital games. Older participants including Bob, Jim, and Nancy were first exposed to digital games (Nintendo Wii) at the assisted living facility where they resided. Jim and Nancy shared that their

experience with the Wii prompted them to explore other forms of digital gaming on the resident computer at the facility.

Younger participants, including Sandra, Eileen, and Janie, were first introduced to digital games by their children in the early 1980s when the Atari home console system became popular. All three women shared that they were subsequently exposed to additional console systems as their children aged and continued to play games. Their exposure has continued as their grown children provided gaming systems in the home of their own children. In fact, all three women reported playing digital games with their grandchildren at least once and considered that gameplay as a valuable means to spend time with them.

Platform preference. Two of the three participants who reside in an assisted living facility prefer to play in a group setting, perhaps as a result of the social design of their living environment. For example, the Wii system is not set up in individual rooms, but in the community room that is designed to encourage social interaction among residents. The other participants (Bonnie, Sandra, Eileen, and Janie) enjoy playing games on their personal computer and typically play non-social games. The platform preference among these younger participants may influence platform preference in the future as their exposure to computers continues.

Reminiscence. The final theme is the role of reminiscence within digital gameplay. This was expressed in four of the interviews. Bonnie shared that when she plays games, she is reminded of fond memories of her deceased husband, as they often played traditional (non-digital) games together. Additionally, Bob, Jim, and Nancy (all Wii Bowlers) recalled a time in their life when traditional bowling was one of their

favorite regular activities. With this in mind, it can be hypothesized that digital games may serve as a means of continuing a once meaningful activity.

The pilot study provided insight into how digital gameplay influences the lives of the senior gamers and how elements of their personal play histories are represented within their gameplay. Emergent themes from this study highlighted the significance of digital gameplay as a source of play in old age and how gameplay interaction is associated with age. These served to provide the framework for developing the primary study.

Primary Study

Research Design

The primary study, a qualitative study based on semi-structured interviews to examine aspects of senior digital gameplay is an extension of the pilot study (University of Kentucky IRB #12-0814-P4S). Rather than exploring general concepts of play, games, and digital gameplay, my research increasingly focused on the significance of digital gameplay in old age and on the way in which participation in digital gaming is situated within the context of personal play histories. A grounded theory approach was used, focusing on the following specific aims:

- I.) To investigate how senior digital gameplay reflects a life course-related extension of the phenomenon of play into old age;
- II.) To investigate the role of functional ability in conditioning receptivity toward digital gameplay among senior gamers; and
- III.) To develop a theoretical perspective on digital gaming in old age.

Similar to the pilot study, participants consisted of senior gamers. The sample was collected in two phases. In the first, participants age 60 and older were interviewed. As data collection proceeded, a perspective began to emerge that highlighted the relationship between age and exposure to digital games. This resulted in the initiation of an IRB-approved second phase to interview participants within the age range of 40 to 59. It transpired that the youngest participant within this group was 44 years old. Participants were recruited via snowball sampling and advertisement within a local older adult organization. Individual interviews were conducted with the aid of an interview guide, and digitally recorded and transcribed for analysis. Coding techniques (open, axial, and selective) and the constant comparative method were used to address the aims of the study.

Methodology

Inclusion criteria. The following inclusion criteria were set to provide guidelines for the formation of the study's participant pool. The criteria were reviewed and asked as part of the Recruitment Script (Appendix 1) for each potential candidate. In addition, the criteria were outlined within the Consent to Participate form (Appendix 2), which was signed by each participant before interviewing commenced.

The first set of interviews consisted of participants aged 60 and above. This age range was selected to reflect the age parameter of "older individual," as stipulated by the Older Americans Act of 1965 (Public Law 109-365). The second set of interviews consisted of participants between the age of 44 and 59. This younger age cohort was sought as a means to capture data from the next generation of older adult digital game players.

As a part of the recruitment process, eligible participants had to also report having fair to excellent health status. This was asked as part of the recruitment script and was assessed by asking each participant how they perceived their overall health. (See Appendix 1.) Possible scale responses ranged from 1 (Excellent) to 5 (Poor). In order to be included, participants had to score between 1 and 4 (Fair) on this scale.

Finally, candidates had to report that they currently engaged in digital gameplay at least one hour per week. It was explained to each potential participant that digital game play involves the use of platforms such as home consoles, personal computers, and handheld devices (iPods, smart phones, tablets, etc.). This minimum time requirement was more than the minimum required for the pilot study (one hour of gameplay per month vs. one hour of gameplay per week). The adjustment was made because it was found that the pilot participants averaged more time playing than originally anticipated. This minimal amount of time is more closely reflective of what has been described as a “light player” (playing less than one hour per day) (Jansz & Martens, 2005).

All eligible candidates were informed that their participation was voluntary and that signing the consent form was required if they wished to proceed with the study. All participants were provided a copy of their signed consent form.

Recruitment of participants. For both recruitment phases, participants were recruited by referral sampling (also known as snowball sampling), beginning first with extant contacts who might have known of potential candidates. My contact information (phone number and e-mail address) was provided to these persons to distribute to any individuals whom they believed would be interested in learning about the study.

Referral sampling began in a small town south of Richmond, Virginia at the end of December 2012. Beginning in January 2013, recruitment occurred solely in a large city in Kentucky. In addition, a University-approved advertisement was displayed within an e-newsletter to members of a local organization within the community that comprises persons age 50 and above. A hard-copy of this advertisement was also made available to the members of this organization at their monthly meetings (Appendix 3).

A second University-approved advertisement (Appendix 4) was distributed to promote the second phase of the study, which permitted gamers as young as age 40 to participate. The second advertisement was distributed to persons in the community as a means of referral sampling.

A recruitment script (Appendix 1) was used to provide details of the study for those who inquired and screening questions were asked to assess the individuals' eligibility for participation. Confidentiality was honored in referrals and throughout the recruitment process.

Upon a satisfactory initial screening, I met with each candidate at a mutually agreeable time and location to review the details of the study. The location had to be deemed as a comfortable and safe environment for both parties and with minimal distractions. Locations such as the participant's residence or a local public library were suggested as potential meeting places.

All appropriate human subjects considerations, such as informed consent and voluntary participation, were enforced throughout the recruitment process and the duration of the study (University of Kentucky IRB #12-0814-P4S). In addition, candidates were made aware that appropriate measures would be taken to keep

participant identity anonymous; this included keeping data in a secure location. Other measures included the use of pseudonyms within the transcripts and any referencing thereafter, not divulging a candidate or participant's involvement if any inquiry was received from a non-University approved individual, and securing materials (e.g., thumb drives, digital recorders, signed consent forms) in a locked cabinet within the University's Graduate Center for Gerontology.

Consent to participate. As part of the process to determine eligibility, candidates were given a "Consent to Participate" form that provided an overview of the study and procedural expectations on behalf of both myself, the researcher, and the candidate should they elect to participate (Appendix 2). Each participant was encouraged to ask questions and seek clarification regarding any aspect of the study and was informed that they could do so at any point in time throughout the course of the study. Candidates that met all inclusion criteria and agreed to the terms stipulated within the "Consent to Participate" were provided a copy that included their personal signature and that of the primary investigator. I also retained a copy, which was thereafter secured in an approved location within the Graduate center for Gerontology at the University of Kentucky.

The interview guide. A University of Kentucky IRB-approved interview guide (Appendix 5) was used for each individual interview session. This guide consisted of a series of questions addressing the overall goals of the study. The interview began with the solicitation of basic information with an eye toward establishing rapport and context for significant points in each participant's life: where the participant was born and reared, educational and employment history, events related to family life, and the

approximate dates of these events. Obtaining this information aided in establishing a life timeline for the individual and provided a framework to which a life course perspective could be applied. In addition, when conducting the pilot study, these factors and events were found to be insightful, and at times significant, in identifying influences within the context of play and digital games.

Collection of basic introductory information was followed by questions addressing and exploring the individual's perception of how they engaged in play throughout their life course. Age stages examined included childhood (age 19 and younger), young adulthood (age 20 to 39), middle adulthood (age 40 to 59), and older adulthood (age 60 and above), if applicable for the participant. In addition to providing a framework for life course analysis, these stages parallel identified categories of age-related play across the life cycle with respect to developmental stages (L'Abate, 2009). For each stage, participants were asked questions such as how they engaged in play at that time, and what/who might have influenced or hindered that form of play. It was up to the participant to determine what constituted "play." (Each participant was asked to share their definition of "play.") For some, play may have included digital gameplay at earlier stages in life. Additionally, questions were asked that explored how individuals' perspectives toward play may have altered over time and how they currently play.

The last portion of the interview focused on current forms of play within the context of digital games. This included identifying how the participant was introduced to digital games and questions related to the evolution of their digital game engagement, preferences, motivation, and barriers. Questions pertaining to platform preference, including technology design, were also asked. This section was explored with each

participant as a means to assess the significance of this form of play within their life. Also, this portion of the interview included potential links of personal play characteristics throughout the life course to the rationale for their current involvement in digital game play. In addition, a portion of the interview was designed to identify age- and ability-related characteristics within a digital game context.

Procedure and analysis. Consistent with the premises of grounded theory, it was estimated that a theoretical sample consisting of approximately 40 participants was likely to achieve methodological saturation of the data categories (Sandelowski, 1995). Each interview occurred at a pre-arranged and agreed upon location that permitted privacy and minimal distractions. Before each interview began, the purpose and process of the interview was reviewed and participants were encouraged to ask questions as needed and to not hesitate to pause or end the interview at any time. In addition, participants were made aware that each interview was to be digitally recorded for transcription and analysis purposes.

All interviews were digitally recorded via a Sony IC Recorder (ICD-PX820). Upon completion, they were transferred to a MacBook Pro (Mac OS X, 10.5.8) for transcription purposes. The *Dragon Naturally Speaking* program was used to transcribe interviews via speech recognition. Upon completion, each interview was reviewed and edited for accuracy and to ensure that verbal cues were included, such as forms of vocal agreement and laughter. Identifying information was omitted to ensure anonymity of the participant.

Upon completion of each transcription, member checking was employed by providing a copy of the transcribed interview to each participant. It was explained that

transcripts would be verbatim and any changes or additions that they would like to offer were welcomed and encouraged. In addition, participants were encouraged to contact me if they wanted to share any additional material.

Transcriptions were uploaded into a qualitative analysis program (NVivo 9) as a means to identify, categorize, and compare emergent themes. An analysis employing open, axial, and selective coding was performed to accomplish this (Charmaz, 2006; Corbin & Strauss, 1990). Coding and analysis occurred simultaneously as a means to guide subsequent interviews and gave shape to the development of a theoretical model.

The constant comparative method was used to identify distinct characteristics among the codes (Charmaz, 2006; Corbin & Strauss, 1990; Glaser & Strauss, 1967). This involved the comparison of data or concepts for similarities and differences within single or multiple interviews. With the aid of the preliminary data from the pilot study, these analytic distinctions helped lay the framework in the creation of theory. Themes were interrelated in the development of a theoretical model of play among senior digital gamers.

CHAPTER 4: STUDY FINDINGS

This chapter provides details of the study findings for Specific Aim I and II. This includes participant characteristics, emergent themes, and discussion points. These findings provide the foundation to the theoretical tenets and model described in Chapter 5.

Participants

A total of 40 subjects volunteered to participate in the study; the majority (22, 57%) was recruited via the posted advertisement. The remaining participants were recruited via referral sampling. The participants (15 male / 25 female, 38 Caucasian / 2 African American) ranged in age from 44 to 77 with an average age of 62.2 years. The minimum amount of time spent gaming per week was 2 hours and the most was 37.5 hours with an average of 11.1 hours per week. Also, the question regarding self-assessed overall health ranged from scores of 1 (“excellent”) to 4 (“fair”). No participant indicated a score of 5 (“poor”). The average score for the assessment was between “very good” (2) and “good” (3)—2.2.

The length of the interviews ranged from approximately 45 minutes to 3 hours. Interviews took place in one of four locations: the participant’s home, a private room at a local library, a conference room at the Graduate Center for Gerontology, or in my office at the Graduate Center for Gerontology. Participants were encouraged to take breaks as needed throughout the interview and, if they preferred, change or postpone the interview to an alternate location.

Phase 1 – Participants age 60+, “Older Gamers”

At the beginning of the study, participants age 60 and above were recruited. This resulted in a total of 29 participants. These participants ranged in age from 60 to 77 with an average age of 66.8, and consisted of 11 males (38%) and 18 females (62%). Four participants reported spending as little as 2 hours a week digital gaming, while one participant reported that they spend 37.5 hours a week on this activity. The average amount of time spent playing was 10.9 hours. Overall health scores ranged from 1 to 4 with an average of 2.1.

Phase 2 – Participants age 44 to 59, “Younger Gamers”

As the study developed, it was noted that digital gameplay trends emerged among the younger participants that differed from those of the older participants. To see if and how these trends continued in younger age cohorts, the minimum age requirement was lowered (with IRB approval) to 40; persons as young as age 44 were interviewed. A total of 11 participants were recruited from this younger age cohort ranging in age from 44 to 55 with an average age of 50.2 years. This subgroup consisted of 4 males (36%) and 7 females (64%) who averaged 11.6 hours per week playing digital games (minimum 2 hours, maximum 30 hours). The average self-assessed health score was 2.3, which is very slightly higher (self-perceived poorer health) than the older cohort. When referring to these two age cohorts of participants, the older (Phase 1 participants) are identified as “older gamers” and the younger (Phase 2) are identified as “younger gamers.”

Table 4.1 – Participant Demographic Data

Name	Age	Sex	HPW*	Health**
Tom	77	M	2	2
Jake	76	M	8	2
Rebecca	76	F	24.5	2
Rodney	75	M	12.5	3
Sarah	72	F	10	2
Mary	71	F	2	2
Lewis	70	M	2	1
Janie	70	F	9	2
Loretta	70	F	8.5	3
Lola	68	F	14	1
Suzanne	68	F	3	2
Dwight	67	M	17	1
Agatha	66	F	3	3
Todd	65	M	15	3
Trish	65	F	10.5	1
Vivian	65	F	4	3
Freeman	65	M	28	3
Ann	64	F	2	2
Francis	64	F	37.5	3
June	63	F	14	1
Judy	63	F	15	4
Brenda	63	F	14	1
Paul	63	M	10	2
Gretta	63	F	10	3
Jerry	63	M	7	2
Greg	62	M	10	3
Yvonne	62	F	6	1
Linda	60	F	5	1
Steve	60	M	14	3
Karina	55	F	12.5	3
Randy	55	M	14	2
Tara	54	F	8	3
Betty	53	F	8	3
Katy	51	F	2.5	2
Jeff	50	M	7	3

Table 4.1 (continued)

Patty	49	F	12	2
Shauna	48	F	2	2
Mike	47	M	30	3
Tammy	46	F	16	1
Bobby	44	M	16	1
Min	44		2	1
Max	77		37.5	4
Average	62.2		11.1	2.2
Total		40 (15/25)		

*HPW = Hours Per Week spent playing digital games.

**Health = The self-reported score for overall general health (1 = excellent to 5 = poor).

Findings: Specific Aim I

Aim I – *To investigate how senior digital gameplay reflects a life course-related extension of the phenomenon of play in old age.*

To gain an understanding of this aim, a review of the participants' primary perception of age-related stages of life with respect to their view of play is merited. Thus, this section describes trends within childhood (up to age 19), young adulthood (age 20 to 39), middle adulthood (age 40 to 59), and older adulthood (age 60 and above) as they relate to digital gaming among the participants as they progress along their life course. Chronological age bands are associated with age norms and expectations, which includes periods of child rearing and employment (Settersten & Mayer, 1997).

Childhood – Birth to Age 19

Exploration, learning, and physicality. All of the participants reported that they engaged in play during their childhood years. The dominant theme pertaining to this period of life was widely recognized among all participants; their childhood play had a

strong element of physicality, regardless of whether or not they had a play partner, such as a family member or friend. With respect to the earliest childhood years (age 10 and below), play was typically characterized as an activity that had limited structure and rules. It was viewed as a time to explore one's environment and boundaries, learn how to socialize, and discover the self in preparation for future life roles. June, a retired teacher who raised her two children mostly on her own, commented, "I learned to get along with other people. I learned how to play. I learned how to have friends. I learned how to be a mother because we played baby dolls."

Vivian, a college instructor and single parent, echoed the sentiment of how play during this phase of life served as a precursor to roles that she would take on as an adult. "I played games with some of my girlfriends, and we would always play house with our dolls or we'd play school. I always got to be the teacher. I had forgotten about that. So, a lot of role playing."

Play was described as a very active pursuit, yet it must be emphasized that all forms of play could not be visually observed. Play in childhood was strongly associated with physical movement, regardless of whether or not it was demonstrated via formal games, such as a sport.

Sue, age 63, recently retired from teaching and enjoys playing games with her grandchildren regularly. She spends time with them each summer at their family's beachfront home. Brenda shared that she was very active in her youth and was involved with both formalized (organized) sports and informal outdoor activity.

Brenda: Did a lot of swimming and bike riding and exploring with friends and just ... I guess, that's how, that's the answer to that. Just doing whatever ... I was always

busy. I was involved in organized things and unorganized, more spontaneous activities.

Julie: Were some of them organized?

Brenda: Tennis.

Julie: That was at school or...?

Brenda: The parks. Swimming was through the public pool. I was there all the time. Maybe even four hours a day I would be at the pool. Ride my bike and lots of times I go there by myself and just be there playing or whatever.

While physical activity was emphasized within their childhood, participants reported a decline in the physicality of their play as they aged. Play became increasingly mental and this was mostly attributed to a decline in physical ability. (This will be further explored within Specific Aim II.)

Rodney, one of the four participants who neither married nor had children, shared stories of how he was physically active in his youth, but experienced a setback after injuring his ankle shortly after he retired in 2001.

Julie: Do you think that how you view play has changed over the years, even since from your childhood years, has play changed?

Rodney: Yeah, I don't do as much. I can't do as many physical things.

Julie: Okay.

Rodney: When I broke my ankle it really set me back.... Again, the sports has slowed down because I can't run.

Julie: You can't run, okay.

Rodney: And I have a psychological block about going up and down stairs.

Julie: Right, okay. So if play has become less physical to you, then has it become more something else?

Rodney: Probably more mental.

Although the physical games enjoyed in youth are no longer possible or feasible for some, these games are once again enjoyed in advanced age via digital means. While the ways in which traditional games are played in their digital environment are mental, they still provide a sense of enjoyment and continuity for those who are no longer physically able.

Paul, an unemployed 63-year old who averages about 10 hours of gameplay a week, shared that he used to play a variety of sports in his youth but is no longer able to do so due to injuries and normative age-related decline. To compensate for this, a number of the digital games he plays are reminiscent of traditional games he once enjoyed through physical participation, such as football. When interviewed, he freely acknowledged that he can no longer engage in many physical forms of play but instead relies more upon stationary forms of play via digital gaming. Although I sought to clarify if “stationary” was akin to becoming less physical, it may be construed as a leading question.

Julie: So it sounds like the ways that you play now, has more of a stationary feel to it?

Paul: Oh, yes. Very stationary.

Julie: So it’s becoming less physical?

Paul: Uh-hm. (Affirmative) More mental... Changed a whole lot, from being very active, to mostly mind games, from being outside all the time playing baseball or softball, football, basketball, to playing on the computer now, so slowed my life down a lot.

Outdoor play. As Paul indicated, play during these years often occurred outdoors, or at least that was the preferred environment; indoor activity was associated with chores. It is noteworthy that there were considerably more reports of outdoor play among the older gamers as compared to the younger gamers. For example, the youngest participant, Bobby (age 44), only commented once on how he played outside – “I can remember really enjoying playing softball or street hockey, riding my bike a ton.” Whereas, Paul, who commented on outdoor play in a previous quote, shared numerous stories of how he played a variety of games outside with his friends. This was associated with a general sense of disappointment among the older gamers that the younger generations seem to spend increasing amounts of their playtime indoors. These indoor activities, as indicated by participants, are associated with less-valued technology-based activities, such as watching television. Furthermore, inactivity is attributed to the perceived lure of technologies that are sedentary in nature and housing environments and unsafe neighborhoods that are not conducive to outdoor play.

Rebecca, age 76, is another participant who indicated this sentiment. She reported that she plays digital games for approximately 24.5 hours per week, much of which she attributes to increasing levels of immobility. Until a recent leg injury, she regarded herself as fairly active and mobile, and it was that incident that prompted her to explore digital games. Rebecca expressed frustration that today’s youth do not engage in socially meaningful activities due to the increasing presence and interaction with technology.

Oh, that's what's missing in the world today. We had neighborhood games like kick-the-can and at night we would play kickball, dodge-ball on our street in front of our house. And kids just don't do that anymore. And

imagination things... Little girls don't do dress up and all that stuff. There's just nothing for the imagination anymore for kids. My little two-year old granddaughter, we have a video of her playing this, she grabs the phone whenever she can, and she'll find what she wants... I mean two years old, it's just incredible.... Tom [husband] and I just roll our eyes, "oh brother!" It's just that it's not the same growing up anymore. It just isn't. I'm glad I grew up when I did.

Sue shared similar sentiments, yet emphasized how she believes that today's youth are not as likely to play outdoors due to issues of safety.

When I look back at how we played differently, these kids, we were free to go out the front door and be gone until the street lights went on. It was safe and we knew our limits. We were taught to be aware, but it wasn't a fear. The kids did not ... if you see kids in the neighborhood, our neighborhood's safe for Woodland, but when you see kids out playing, it's like, "Where are the parents?!"

Imagination and creativity. These earlier years were also reported as a time to use imagination and creativity via play. This was regarded by many as a naturally occurring yet essential component of play, especially among those who did not have much opportunity or access to play partners. Participants shared how imagination was a component of play when they were by themselves or with friends. Yet the importance of imagination was emphasized among those who believed they experienced barriers to socialization in their youth. This was attributed to factors such as personality (e.g., shyness, introversion) and geographic constraints (e.g., living in a rural area).

Although Agatha, age 66, believes that she is a fairly outgoing person, she shared that she regarded herself as a shy child and explained that she used her imagination when playing with her dolls. "You imagine them going places and doing things and they put on this dress and they'd go here and there and everywhere, a place that you would never be able to do yourself." It can be suggested that this form of imaginative and creative

play provided a foundation for her career in journalism and is still evident in her current forms of play, such as creating sewing patterns and playing online puzzle and word games, such as *Multi-Eight*.

A gradual change in play dynamics.

Time availability in childhood. Participants also reported that as they progressed into the later stages of childhood (adolescent and teenage years), personal play dynamics began to change. First, there was a common theme of a decreased amount of time availability for play due to an increase in family and academic responsibilities or employment. For example, one of Agatha's first formal jobs began at age 16. She began as a volunteer for the American Red Cross as a switchboard operator and her hours increased to the point where she began spending her summers with the organization. "I was hired at 16 and that was great so I had a paid Saturday morning job and then summers."

This sense of commitment continued to increase as the participant aged into adulthood. Examples of circumstances that hindered play during childhood included chores within the home and an increasing load of homework. Katy, a younger gamer (age 51) indicated that as she got older she felt a growing sense of responsibility to schoolwork. She attributed much of this sense of obligation to the financial sacrifice her parents made that allowed her to attend private schools.

Teenage years, I didn't play a lot. I was always a pretty serious student, always kind of knew what I wanted to do. I always wanted to be in a science field, so I took a lot of science classes and stuff like that, so I was studying a lot. I loved to read, so I was a total book worm. But once I got more into that, I didn't really play a lot. I would go outside, and I would read and pretty much the summer, I spent most of the time reading... They never expected me

to get all A's or anything like that, but they expected me to do my job and to do the best I could. I guess I put the added pressure on myself, because I knew how much they themselves personally sacrificed to give me this...

Socialization. This stage of life was also reported as a time when play began to be reflected in new forms of socialization: going to the movies with friends, dating, dances, etc. These activities tend to accompany increased amounts of freedom (from parental supervision) and access to peer interaction. These forms of play were regarded as a means to understand and practice the societal rules of etiquette or, in contrast, to challenge parental and social expectations. At the same time, the social circles of many participants were expanding, as they had increased opportunities to meet new people or develop relationships within these contexts.

June provided numerous instances of how she socialized in her youth. Her playmates in early childhood consisted of neighborhood children her age, yet as she aged her social circle expanded.

As we were 15, then we had friends, of course, that were a little bit older, and then they would come and pick us up, and we'd go to the movies on Sunday night, and there was a little movie theatre in Irvine... That one little movie theatre, and so our opportunities to play were to have a party, to go to the drive-in, you know, all of us to be together... And that was the thing. We just wanted to be together so we could socialize and visit. We'd have slumber parties. Slumber parties were awfully big.

Organized forms of play. It was also shared that play during this period began to take on a different structure with respect to organized forms of play. There was an increasing amount of respect for rule adherence with activities such as formalized games and sports. It was mostly the men who shared that they participated in organized sports, whereas the women shared stories of organized social outings, such as formal dances. A

perceived consequence of this shift was the limitation to utilize or demonstrate imagination and creativity. This was not regarded as a negative outcome to aging, but a natural progression and process of approaching adulthood.

The establishment of play preferences. Although reported forms of organized play varied greatly among participants during this stage of life, there were some commonalities that indicate the establishment of play preferences. There were frequent reports of playing various card games in these early years, such as *Solitaire* and *Euchre*, and oftentimes the game was learned from a family member. In addition, card playing and traditional board games (i.e., *Scrabble*) were reported more often from older gamers as compared to the younger gamers. This suggests a potential generational difference with respect to exposure to or preference for particular game genres, which may influence future game digital games preferences.

Age as an indicator of play preference. The youngest participant, Bobby, averages 16 hours a week playing digital games, most of which are story-based action games. Not once in his interview did he mention playing cards in his youth. This was the same for Tammy, age 46. She also reported playing story-based games for approximately 16 hours a week and she, too, did not mention playing card games in her youth. In contrast, Yvonne, age 60, shared that she was introduced to card games, in particular *Solitaire*, in her youth by her mother. Interestingly, *Solitaire* remained her game of choice and she now plays the digital version of the card game approximately 5 hours a week.

Yvonne: We played board games some, but for the most part, nobody wanted to play board games near as much as I did. Partly then I would just ... I'd play *Solitaire*. That was

how I got into playing solitaire because you could play *Solitaire* with one person.

Julie: Who taught you that?

Yvonne: I think my mother.

Julie: Your mother did?

Yvonne: Yes.

Julie: Did you play a lot of cards?

Yvonne: I played when everybody would play cards.

It is noteworthy that when analyzing favored games in childhood, the younger the participant, the more likely they were to report non-card games, such as puzzles and early editions of digital games. Particularly with respect to digital games, this is indicative of the significance of life course, as younger gamers (and the youngest older gamers) were introduced to these games in their youth. This is not surprising, as digital games were marketed to mostly young persons.

This is where a clear distinction began to emerge with respect to the age of the participant. Older gamers were more likely to indicate an introduction to card-playing and board games in their youth and still continue to play these familiar games digitally. Popular digital game preferences among these older gamers include *Solitaire*, *Free Cell*, (both card games) and *Words with Friends* (a derivative of the board game *Scrabble*).

As previously mentioned, Rebecca began playing digital games shortly after a leg injury, which rendered her immobile for months. Her husband lent her his iPad and encouraged her to explore game options. Although she does not regard herself as technologically savvy, she found herself playing online versions of *Scrabble* and *Jigsaw*

Word with her friends. “My friends knew I was sitting and needed companionship, so they fired right back at me. I would say five hours maybe, four or five [a day].”

Rebecca first began playing the traditional (non-digital) versions of those games in her youth and attributes the introduction of these word-based games to her father.

I remember growing up, that's what I did with my dad. He and I played a lot of word games, a lot of *Scrabble*. There was another board game. I can't remember what it was, he was very important in developing my vocabulary. Yeah, I remember that very well. My mother, she wasn't into that kind of stuff... but we played a lot of word, making words...

Most of the younger gamers were exposed to early editions of digital games at some point in their late childhood years (or early adulthood years) and continue to play today. This also holds true for some of the youngest older gamers, as they were young adults when digital games were introduced to the general public. Although they no longer play exactly same games, the games they currently play are reminiscent of those earlier games. Furthermore, these games tend to either have a puzzle-based theme or are story-based, as compared to card games, which were a common preference among the older gamers.

Social factors as indicators of play preferences. Four of the younger gamers who play story-based games indicated a strong tendency to read science-fiction (“sci-fi”) books in their youth. This, too, is evidence of the life course influence, as this coincides with the timing of the first space flights in the 1960s. These historical events resulted in the mass publication of sci-fi books that captured the attention and imagination of numerous younger gamers when they were children. The reported fascination of this genre remained strong as they continued to age and was the foundation for their gaming

preferences as they aged. This play preference that emerged in childhood is still evident today, as they continue to play digital games with sci-fi components.

Bobby shared the significance of reading sci-fi books in his youth and emphasized its continued importance as a basis for digital game preference in his adulthood years.

Bobby: As a child, a lot of these things took place in my imagination. Books were the gateway to other people's imagination, but always you visualize the story as you read it yourself. As I grew older play and gaming in particular were with me. We're in a gaming renaissance right now where play can become a very rich thing that leads to broadening your horizons.

...

Julie: You mentioned your reference again to the sci-fi that you so much enjoyed in your youth. I was wondering did that element still continue, that interest of ...

Bobby: Oh yeah! *Halo*, *Planetside 2*, I love the science fiction games... Science fiction and fantasy, sure, I absolutely love playing those games. I play *BioShock*. I play ... gosh, the list is too long to mention, but *Half-Life* and *Half-Life 2* were just breathtaking.

Reading as an indicator of play preference. Just as Bobby and other younger gamers reported reading as a form of play during these early years, so too, did many of the other participants. In fact, most (30) of the participants shared that they were “readers” and the majority of those regarded it as a form of play that began in their childhood. Furthermore, approximately half of the participants continue to regard themselves as avid readers. Although this does not indicate a causal relationship, further investigation of this variable is warranted.

The older gamers who reported reading as a play activity in youth currently play digital games that incorporate word puzzles (i.e., *Solitaire*, online edition of the *New York Times* crossword puzzle, and *Words with Friends*) or story-based games. Based on these

interviews, there is indication that digital gameplay is a form of play that branches from a foundation of reading established early in life. It can be hypothesized that for these gamers, digital gaming is a continuance of a specific, preferred form of play as they continue to age.

Vivian, age 65, described herself as an avid reader, an activity that she has enjoyed since childhood: “As a child, I read a lot, and then my mother would take us to the public library on Saturdays and we could check out as many books as we could carry, and so I had pretty long arms and I would just load up and in a week, they would be gone. I spent a lot of time reading.” Now she does much of her reading on a portable electronic device and also uses it every day to complete online crossword puzzles, which she associates with her love of reading.

Although both Bobby and Vivian incorporate earlier forms of play into their current digital gameplay, there seems to be a digital divide with respect to which games they chose to play. Digital games were integrated into the lives of the older gamers at a later point in age as compared to the younger gamers. This is logical because the introduction of computer technologies to the public and their integration into society came at different points in their lives. This is noteworthy among the older gamers, as they have less experience with interactive technologies, such as computers, and are less likely to seek new, unfamiliar games. So, although they continue to play digital versions of traditional games learned in their youth, it is not likely to be the more complex story-based games that are more common among younger generations of gamers.

Judy, a retired social worker at age 63, shared that she read quite a lot in her youth and still reads today, yet this did not influence her digital game playing preference.

Rather, for about 15 hours a week, she plays digital Solitaire, a game that she initially learned in childhood.

Julie: When you played “Solitaire” [digital game], did it remind of when you played ... you said you played “Solitaire” [traditional version] starting at a very young age... did you play because you enjoy or that you were just comfortable with it?

Judy: I was comfortable with it. I knew how to do it. It wasn't a learning curve other than whether I turned over one card or three cards.

Young Adulthood – Age: 20s and 30s

All of the participants reported going to college or receiving some form of specialized training after high school before entering the workforce. This period not only marked a transition into adulthood but also a transition in how they played.

Participants shared that as they progressed through their early 20s, they had obligations to school and work, yet found time to interact with friends and colleagues. Many of the male participants shared stories of playing informal sports, while the females were more likely to engage in social outings. In addition, numerous participants provided examples of how they and their significant other would have play dates with other couples. The games of choice were typically card games like *poker* and *bridge*.

Time availability in young adulthood. All of the participants shared that there was a gradual decrease in the amount of time spent playing as they continued to age. This decline was noted to begin during the late childhood years and continued as they entered young adulthood. It was repeatedly expressed that obligations to school/work and family began to emerge during these years. As these obligations increased, time availability for play began to decrease.

Participants shared that this decline continued and available time for play remained low during their working career. All of the younger gamers are still working and report limited availability for play. The most influential decline indicated by the participants occurred once family (children) commitments emerged.

June, who was introduced earlier as being very sociable in her youth, shared: “Before we had children, we took more road trips to go to away games. Then after the children that wasn't so easy to do.... we got busy and life happens and everybody's going in four different directions.” When I asked her how this decrease in play time affected her, she commented further on the effect of family. In particular she pointed out the influence of a failing marriage on her well-being and playtime.

I think it made me more... I wasn't more introverted, but I began to withdraw from the rest of my social circle. I did do that. I withdrew a lot. Part of it was because of my marriage was not good and we weren't doing things as a couple, so we weren't going to do things with a group. That cut into play time a lot. That made a huge difference in play time. I just felt like there was no play at that point in my life. It was all work.

The influence of gender roles. There was a difference in the amount of time spent playing during this phase of life when comparing the accounts shared by the men versus the women. The men expressed a greater amount of time availability to play and higher levels of engagement in play. This often took the form of sports, card games, or spending time with male friends in a relaxed environment, such as a bar. In contrast, the women expressed a significant decrease in time availability to engage in play during this period of their life, which was reportedly due to child-rearing commitments. Few male participants suggested familial obligations as a hindrance to play.

Additionally, eight women commented that they believed their husbands had more unobligated time to do as they wished because they did not have as much personal time invested with the children. June expressed how her commitment to the family, with limited support from her husband, affected her. This sense of loss is significant because June later shared that digital games became a way for her to play again.

Well at the time I didn't realize that it was happening. I didn't realize that I was losing "me." That's probably why I don't remember much of the 80's or into the 90's because I was so busy doing for everybody else and doing everything else that I didn't realize that there wasn't anything for me. That I didn't do anything for me. I just did everything else that needed to be done. It was like you have to go to work. You have to buy groceries. You have to get the children up. I did it all. I had very little help from their dad. You do what you have to do and until it's all over and you're looking at it from the rearview mirror you don't realize that all of a sudden I woke up one day and it was like "Oh, wow." The children are gone. There's no husband. Who are you? What do you want to do? I probably started that before the divorce, see, but when the children were gone, it was like "Okay, I don't know who you are."

The female gamers who expressed feeling a lack of spousal support shared that this period into their life (and Middle Adulthood) was particularly stressful. This was amplified among those females who eventually divorced (16 participants), yet still had the responsibility of rearing the children while maintaining a job (14 participants). This dual-role among women is another example of the influence of the life course perspective. This concern was not as common among the older non-divorced female participants because most of them were not employed outside of the home while the children were young (seven individuals expressed this view).

A potential consequence of limited personal time, as expressed by the women, was that most of their "play" was child-focused. The majority of their play took place

with their child. For example, they shared stories of how they played games (informal and formal) with their children or watched their children play. Most of the women did not express negative feelings toward this, yet the lack of and desire for adult and personal play was noted.

Janie, age 70, recalled how she dropped out of high school to marry her husband; her son was born the following year. She spent a lot of time playing with him, but considered it more as a means of play for him, rather than herself. Furthermore, as her marriage ended a few years afterward, she took on a greater amount of responsibility by raising her son on her own and working a full-time job.

Well, I liked to take him to the parks. I went to camp horseback riding. There used to be a riding Academy and I would take him horseback riding and I would take him to the movies. Just whatever he wanted to do. I would take him to the fair... It was more for him. It was for him because I wanted him to do things that he enjoyed... There's not a whole lot you can do when you are raising a child and working a full-time job and a part-time job in going to college. It doesn't [give you a] whole lot of time to play.

Overall, the male participants did not express limitations to personal play due to familial obligations. The primary barrier reported to play during these years was a commitment to career. Nonetheless, there were more accounts of and a greater variety of play among the men than the women. The men were more likely to spend time with friends and the play that occurred with their children was more exploratory or sports-like in nature, such as flying a kite, bike riding, or coaching a little league team.

Tom spent his entire career in the military and the lifestyle it afforded had great influence over him and his family. It involved frequent moves and made it difficult for him to have what he referred to as "downtime."

Three totally different jobs, so yes, the downtime was definitely dependent upon the military job and location. I guess I would say job because the job depended upon the location itself... Then I still have a civil service job to work on full-time and I had four years of school at night, so they all added up. I was coaching baseball. As my son grew up, I went up with him. It started in T-ball.

The influence of social and generational norms. It is important to bring attention to the participants who neither got married nor had children (four individuals), as well as the younger gamers, when considering social norms within the context of play and digital gameplay. This theme suggests the influence of a societal shift within the context of gender roles and generational norms. Those who were unobligated to a family did not report as great a decline with respect to play during this period of their life. Rather, these persons were able to provide ample examples of how they continued to play during young adulthood. The primary time consumer for these persons was work, yet it was not expressed as a significant challenge.

Jeff, a younger gamer who never married, shared about his early days in the military before changing his career by going to law school. He expressed that there were ample amounts of time for play and, in particular, social games. This was a precursor to his spending 10 to 16 hours a day during weekends playing digital games.

I was an MP but I wasn't in law enforcement. I was in security and so our job basically was a lot of sitting around and so we had a lot of spare time and then we would have to react if there was an alert or something like that. We had a fair amount of time to do that. I used to ... *Axis and Allies* [a military-themed game] was the game I remember. I wore the damn thing out. I played it so much and it was, you know, a bunch of people.

Similar to the older gamers, the younger gamers shared how they experienced significant time constraints during this period of their life, yet there was a commitment to

play via digital games. Shauna, age 48, currently averages two hours a week of digital gameplay. Yet, when she was a graduate student in her late 20s (in the late 1980s), she reported spending ample amounts of time playing digital games. “I’m a first year graduate student. I have a small child and I just discovered... computer games. I didn’t sleep, like, ever.” At the time she was married and shared responsibilities with her spouse. She noted a substantial loss of time for digital gaming after her divorce. “Full custody of [children]. No family in town ... and his family of course abandoned me. Yeah, no time.” Shauna is now back in graduate school for another degree and although her children are older, she still does not have much free time, though she still makes a point of playing digital games in small increments:

I would play little games, not things that were involved and took a long time. It’s the little games that are, that involve 10 minutes of time of just you’re going to do this, solve the puzzle, do whatever all on the computer. Most of it, yeah, all on the computer.

Time availability among the participants during this stage of life is important when considering senior digital gameplay because it represents the introduction of significant play barriers. This takes into consideration how the participants were affected when play became limited and which forms of play were maintained (or transformed) as they aged. For example, female participants, such as Shauna and Vivian (below), shared that as their personal forms of play became increasingly infrequent, roles in their life became blurred due to high levels of stress. They viewed themselves as a wife, a mother, a worker, etc., and any time they happened to have a rare moment of play, they were grateful. The recognition of play as a valuable component of the self became increasingly apparent as they aged into middle adulthood.

Vivian, an older gamer who was 65, went through college and worked a full-time job all while raising a son on her own. She expressed the tremendous amount of stress she experienced during this period of her life and shared that she could barely recollect any form of play during that time. Her stresses increased into her 40s, as she began working 60-hour weeks so that she could buy a house.

Frankly, I don't remember a lot of play in my 30's. I really don't. I was working too hard to keep my life together, to get us moved and get my son in a good place, so I don't remember. I didn't know... when I came to [city], I knew no one. I had no connections. I knew no one... I had very little leisure time, and I worked in my 30's and into... 30's and 40's I did not play much at all.

This made her keenly aware of how much she cherished the opportunity to play.

“As an adult, I learned that that's not the structure of the adult life, and so those playtimes became, in some ways, precious.”

Digital gaming within the home. Young adulthood was critical for many of the participants, as it signified a time when home gaming consoles, such as the Atari, and home computer games became common within the home. All 11 of the younger gamers were playing digital games at this point in their lives, even if the system was not bought for them, but for their child or spouse. Katy, a 51-year old younger gamer who is currently a research lab technician, had two children in the 1980s, which is when console systems first became popular. Although Katy was first introduced to early digital games at the local arcade in her late teens, it was in her 20s that she began to play, as the console became a fixture in her home.

We had one of the first... Atari was first with *Pong*. So, we had one of those. We've had pretty much all the game systems. Never had an Xbox. But we started with that

[Atari]... He [spouse] got it actually. I think I got it for him.

Although the 1980s are recognized as the era of which digital games became widely popular, they were introduced to the public in the 1970s. Paul, age 63, is one of the 11 older gamers who shared how digital games became integrated into their lives during their young adulthood years. This is noteworthy as this provides evidence that the older gamers, not just the younger gamers, adopted digital gaming technologies into their home and lifestyle at a relatively early age.

Julie: When did you get the Atari [gaming system]?

Paul: I think it was '74 or '75.... I had that and you had to play it on black and white TV, of course color, they weren't in color.

Julie: What prompted you to get that?

Paul: It was something new and neat to do. Everybody else was getting them, so ... I wanted it. [Laughs] I played at a friend of mine's house, so I wanted one too, so I got one.

Julie: How old were you when you got that, then?

Paul: About 24, 25.

Not all of the older gamers who had early game systems within their home during their younger adult years engaged in digital play. Although all of the older gamer men (5) played, the older female gamers (6) expressed limited interaction. An older female gamer, Agatha, shared a story that became common among the females in this group. Her children were bought a home console system and oftentimes, it was they who played and more often than not, it was her spouse who was the more likely parent to show interest in the game.

The kids had Nintendo and all that... I remember Franklin coming up from the basement, he was so little. And he's got "Oh, I got the harvest bonus board." And I thought, "What's that?" I don't know. It's one of these games where you shoot, like in shooting gallery in an amusement park. Ping, ping, ping and knock them all over. He got the harvest bonus board, I would not have known the first thing about it, "What's harvest board?" In a way the kids, they took over their own games, and my husband was really interested in getting them the next new thing all the time.

The minimal interaction displayed by the older gamer females may also be attributed to a concern for appearing childish, especially if in a public setting. Arcades were a popular play setting for children during this time (1980s) and this is where June first tried to play, yet she was too embarrassed to play on her own.

We had an Atari, we had a Nintendo... I never played with those. I tried playing *Pac-Man* a few times, but I was embarrassed to play in public if we were out someplace. The children would want quarters, but no adult. It was like playing a pinball machine. When I was growing up, my daddy thought that was just the height of sorry-ness for boys to stand around and play the pinball machine... So I just didn't. I was embarrassed to play a game in public like that. I'd watch the people see me doing this; they'll think I'm crazy. But if the children were there then it was okay. Then I could kind of play with them and I would want to play then. And they played Tetris and Pac-Man and those kinds of things and I would watch and maybe try it once or twice with the Atari or something, but I didn't ever spend time. I just tried it maybe, that was it.

Middle Adulthood – Age: 40s and 50s

The stories shared by the participants in this phase of life were similar to those of young adulthood. This period was marked by continued obligations to family and work, yet aspects of physical decline became more common. (Physical decline is addressed in Aim II.)

Time availability in middle adulthood. It was during this time that participants were established in their career, tasked with managing the needs of their adolescent children and in some instances, addressing or coping with marital complications. June was one of the 16 divorced female participants, and, similar to Vivian (discussed in the previous section), was overwhelmed with the pressures that resulted from divorce. It was during her middle adulthood years that she and her husband divorced and she felt overwhelmed with family and career obligations. Consequently, she did not have time to engage in personal forms of play, which affected her sense of identity. This provides evidence of how play, including digital forms of play, can become an afterthought when confronted with significant (self-perceived) stress.

So I was 57 years old [post-divorce] and it dawned on me that I had no life. I had no... I had work and that's all I had. I didn't know what I really enjoyed doing. I quit smoking. I've lost 50 lbs. I had done all these things and it was like "Okay, now what are you going to do? What do you want to do? What can you do? You can work." So I kept on working and then probably the best thing that happened and the worst thing was losing my job because it really made me have to think about who I was and what I wanted to do. I had been Ms. Bentley. I was the teacher. I was Katie's mother. I was Jimmy's mother. I was not June... When I didn't play, I was gone. Those years that I was working all the time with family and career I wasn't playing. That's when I lost "me,"—when I didn't play.

Stressful life events, such as the aftermath of June's divorce, seem to interrupt the continuity of play. All of the participants expressed a decline in the amount of play during these years, yet it was emphasized among those, like June, who experienced notably stressful life events. This prompts one to consider how they resumed play later in life and why digital games were appealing.

For participants like June and Vivian, digital games were a peripheral activity in their lives during these years and active gaming was adopted after retirement. June was introduced to digital games in her early adult years via her children, but did not play much until she found games on her computer at work. Still, it was not until she retired three years before our interview that she became an active player, which is when she also purchased her first smartphone. She now averages 14 hours a week of digital gaming on her smartphone.

I started on a computer at school, when they introduced computers at our school and we had computers in the room. We had IBM computers and they had *Solitaire* on them... Then once I got a smartphone that had games on it, I hardly ever played on the computer anymore. I play on my phone.

Games played on a smartphone can be appealing because they allow users the opportunity to try various games with little to no commitment (time or financial). This means that if a game is disliked for any reason, it can be immediately dropped and the search for a new one can begin. This element of exploration is important, as it permits users to better identify their play preferences and for participants like June, it is a process that continues to this day.

June: Not too big on crossword puzzles. Once again, you had to think a lot [to play] and I don't like to do that. So I'm not about that...

Julie: Have you had many instances of downloading games and then think, "Ew, this is terrible. I hate it. It's not for me."?

June: Yeah. Then I just delete the app.

Sue, a 63-year old retired teacher who averages 14 hours of digital gameplay a week, started playing on the computer at work during this phase of her life. Although

neither Brenda nor June reported much game playing during this time, they both currently enjoy exploring games on their smartphone and will delete them if they are not sufficiently appealing.

I think there are some, yeah, and I just have to dig in and see. Usually what I'll do is, like in the Sunday paper or magazines or whatever art magazine, I won't get into that too much, but even Reader's Digest has suggestions of games that might be interesting. I'll download them and see what's they're all about. That's how I find out about different apps. Yeah, I'm always looking for apps to put on the phone.

....

I had to delete that because it's just like, "I'm done with that."

The younger gamers are still within this phase of life and referenced more to play during this period as compared to the older (age 60+) participants. More notable was that the younger participants reported a higher frequency of play in the form of digital games, especially among the male participants. This is evidenced by the average amount of time spent playing digital games (see Table 4.1).

Older Adulthood – Age 60+

A shift in time availability for play. Most (21, 72%) of the participants in this category are retired from formal employment and none reported having any children or grandchildren, residing within their home. Based on an analysis of the interviews, these are influential factors that allow the participants to have more time available to do as they choose, such as play digital games. Those in the group who are not yet formerly retired also report a greater amount of time availability for playing digital games in comparison with their middle adulthood years, because their children are now adults and no longer reside within the home.

This period of life was viewed to as a time to relax, yet to stay active at the discretion of the participants. Active in this sense refers to both physical activity and involvement with selected interests. There was an overall increase in the amount of and emphasis on play during this period. In addition, there was a sense of increased appreciation for play from a retrospective standpoint.

Lewis, age 70, is a retired university professor who shared that he was addicted to a digital game in his middle adulthood years and upon realization of this addiction, drastically cut back on how much time he committed to digital gameplay. He currently plays for about two hours a week. Lewis shared insight on how play transitioned throughout his life and how beneficial he finds downtime in his retirement years as a break from previous forms of stress.

Well, I think as I got older and had more obligations, as a young child, play was often a function of getting out from under the parents' feet so they could get their jobs done. There was more time allotted to play and I probably saw work and chores more as an infringement on the way life ought to be.

Whereas, as you get older and have greater time spent doing things that need to be done for the family and so forth, then that opportunity to shift gears for a minute to get away from that just be engaged without any set purpose. Play probably takes on a greater sense of value when you play.

I feel like I've shifted gears. It's a little bit in terms of the game is shifting from the routine of things that you feel like you have to do to something else. Maybe the game is going down and working in the garden for a half hour, playing in the dirt. Somebody else might say, "I don't have to do that anymore. I'm past that." For some of us, it's relaxation. It's sort of relief from the other stressors.

In addition, Lewis regards himself as being a competitive person, yet enjoys digital gaming as a source of relaxation, which is contrary to how he once regarded gaming. He still keeps track of his scores and challenges himself to improve, yet he does not express himself to be as obsessive about it as he was with digital game scores in his younger years.

I find now, if I get on the computer and I'm doing something, and the computer's searching everything, "I'm going to let it search. I'm going to run through a FreeCell game." There's enough challenge there. I keep track of my scores. I win, overall, over many, many that I've piled up on this one computer; I'm probably winning about 73% or so. I've got to win a high number because there are a lot of them there to get that percentage to shift. I find it a bit of a challenge.

Again, it's relaxation for me. It's something else if I think I really don't want to tackle anything else for a few minutes. When I saw that you needed to have people spending at least an hour a week, I thought, "Do I do that?" So, I started timing myself. I thought, "I can sometimes spend 20 minutes at a stretch seeing how many of those games I can win in a row or something like that." Time again, one of those essences of plays, that you lose the sense of time.

Renewal of play in old age. There was greater emphasis on the importance of play during this stage of life, as it was regarded as an earned right that had been largely neglected since childhood. Participants reflected upon how they wish they could have played more during their younger and middle adulthood years but felt restricted due to family and career obligations. This perspective was more prevalent among the older female participants, such as June. June's story was typical in that she spent the majority of her young and middle adulthood working and was so overwhelmed with obligations, that she did not have much time to slow down and play. Although she is retired, she still

catches herself wanting to keep busy and has to remind herself that it is okay to play and pursue activities, such as digital gaming.

When I was a child, my main focus was to play, but as an adult, my main focus has been work, so stopping working ... not working is almost like play again. I didn't have any other thing to do but play when I was a child and as an adult, I have to remind myself to play.

I feel guilty if I'm not working, and so I have to remind myself "It's okay for you to sit down here and knit all day if you want to. It's okay for you to spend two hours playing computer games if you want to. You've earned that." So when I have free time, I have to remind myself that you don't have to be working. You don't have to be doing something, and that's the biggest thing for me, that I have to remind myself that it's okay to play...

I enjoy it [digital games] and it's fun and it's okay to have fun... It's okay for me to relax and have fun and enjoy myself, but that's been a hard thing for me to let go of... that I can cut back on my work. I can slow down some and pick and choose and do what I want to do. So that has been the hard part for me, at this age.

When play was described during this life stage, it was characterized similarly to that of play during early childhood. Participants feel a greater sense of freedom to play as they like and do not feel as restricted by rules. In addition, there are a wide variety of activities that constitute play as compared to the other adulthood stages. For example, common responses from the participants regarding current forms of play include walking, reading, playing a musical instrument, creating art (painting, crafts, drawing) and engaging in activities with their grandchildren.

It was also reported that there has been a greater opportunity for imagination and creativity during these later years as compared to earlier adulthood years. For example, participants shared examples of how creative forms of play, such as artistic endeavors,

relied upon their sense of imagination. This was also prevalent among those who commented on reminiscence as a form of play, as they believe it involves more of a cognitive component as opposed to the physical engagement that is often associated with play.

Agatha, a retired journalist who prefers to play online crossword puzzle games, shared how she currently uses her imagination and creativity to engage in play. She then shared how she links her preference for word and card games to her father and family; thus, evoking a sense of reminiscence.

Julie: Do you feel that... or do you believe that you use your imagination now or versions of imagination when you play now?

Agatha: Yeah, my husband says I'm creative, I don't know about that exactly, but I still love to sew and do crafty things and all that, and it's usually because I don't ... I think I can copy something or I think I don't want what's in a store. I'd rather do on my own, that kind of thing, as far as imagining of what I can do, yeah.

Julie: Do you view imagination then as a form of play?

Agatha: Yeah, I think I would qualify that, yes... I love crossword puzzles, too, and I always think about this; my father being... English was not his first language. He used to work with crossword puzzles to learn English, to learn words to the point that we didn't get to do those. That was reserved for him. I think it was that kind of like "this is forbidden" in a sense.

Julie: Thinking about playing those kind of word games, you think about your dad ...

Agatha: A little bit... I think maybe the cards probably would really bring back a lot of the family, big family memories.

Findings: Specific Aim II

Specific Aim II – *To investigate the role of functional ability in conditioning receptivity toward digital gameplay among senior gamers.*

The participants expressed a range of health-related concerns that have caused, or that they believe may cause challenges to engaging in play as they age. Specifically, the participants were asked to share which, if any, health-related concerns currently affect or may affect digital gameplay in the future. The concerns expressed included functional ability issues of mobility, vision, arthritis, and cognitive decline. Each of these domains was explored as to how the participant believes they currently hinder or may come to hinder digital gameplay.

At the initiation of each interview, participants were asked to rank their overall general health on a scale of 1 (“Excellent”) to 5 (“Poor”). All of the participants reported to have at least a “fair” level of health. The entire sample average is 2.2, the older gamer health average is 2.1, and the younger gamer health average is 2.3. (See Table 4.1) Only one participant, Judy, reported using any assistive technology for mobility purposes (a cane). All of the older gamers reported varying amounts of age-related decline, but none that prevented them from engaging in digital gameplay.

Mobility

A barrier to play. All of the participants shared that play has become less physically active for them as their adulthood years advanced and as they moved toward old age. This was more pronounced among those who reported an injury that directly affected their mobility. For example, physical limitations expressed include a broken ankle, arthritic pain, and joint (knee and hip) difficulties. These age-related challenges

have prompted the gamers to seek alternate ways of playing, such as digital gaming, that are more accommodating to their needs.

Rodney, age 75, is a retired government contractor who plays an average of 12.5 hours of digital games per week. He shared that he used to be very physically active. He enjoyed attending local sporting events in his youth and for the majority of his adulthood years. When he was in his 60s, he broke his ankle when hiking.

Rodney owns two computers – a desktop used for book-keeping is located on the second floor of his house and a laptop that he uses to play digital games is kept in his living room area on the lower level of the house. Although he reported that the desktop is easier to manipulate than the laptop, he prefers to avoid navigating the stairs unless this is absolutely necessary, as it makes him nervous that he will again fall. Thus, Rodney primarily uses the laptop for gaming purposes.

An opportunity for digital gameplay. Participants, including Rebecca (age 76), shared stories of how they experienced a short-term debilitating event that caused them to be immobile for a period of time. In this case, digital games were regarded as one of the few play options available, as most games do not require significant movement. Rebecca reported that she experienced a medical mishap, which she believes was caused by the doctor, and it significantly affected her mobility. Because she was confined to her couch for several months, she felt limited with respect to play options. It was this incident that initiated gameplay (via use of her husband's iPad) and resulted in her regular use of digital games as a means to both play and socialize. Rebecca shared that it was during her time of immobility that she spent a greater amount of time playing digital games.

This suggests that a gamer may be inclined to spend more time playing digital games (a sedentary activity) if they perceive themselves to be in a limited mobility situation.

Rebecca: I play *Scrabble*, *Jigsaw Word*, I think those are the only two games I play.

Julie: About how many hours would you say that you play?

Rebecca: Too many. Well, I am playing *Scrabble* with four people and gosh, how many hours is it, it's hard to say. Well, it has cut down now some now that I am up and mobile, but September through November, it was a lot. But normally, maybe two hours a day. Maybe two hours a day. Maybe not quite that much.

Julie: But when you were immobile, about how many hours did you spend?

Rebecca: Oh gosh, lots. And my friends knew I was sitting and needed companionship, so they fired right back at me. I would say five hours maybe, four or five.

Julie: Which one did you play the most?

Rebecca: Scrabble, yeah I, I just got introduced to jigsaw word. It's a really fun game. I'm not sure if you're familiar with that game or not...

Julie: What is it that you like about playing Scrabble?

Rebecca: Well you know the one fun part of it is that you can chat, on the part of the screen there is an area you can chat with the other person, so I have a lot of fun doing that, chatting with people while I'm playing Scrabble. We'll exchange different things.

With these situations in mind, mobility can be considered a determinant of time allotted to, as well as a reason for, digital gameplay; as mobility decreases, engagement in digital gameplay increases. This seems to be more the case with the older gamers who do not have an extensive history of digital gameplay in comparison with the younger

gamers who have been playing since their young adulthood years. Those who have found themselves playing more due to a gradual decline with respect to mobility have not been exposed to digital games for very long. In contrast, this association did not seem to be as pronounced among those who have been playing regularly for years.

Dwight, age 67, is a retired agricultural researcher and prides himself in keeping active with numerous sports. In fact, he was drafted to initially go to Vietnam during the conflict, but was selected to play professional tennis for the Marines instead. He stopped playing tennis three years ago due to joint pain and I asked him how this functional limitation affected him. “I guess in the three or four years that I quit, I played golf and I took walks and hikes and camping.” This indicates gradual involvement in activity that is less physically demanding as functional ability declines. This notion spurred me to ask Dwight if and how his play may change in the coming years. His response suggests that digital games may be an appealing option because they are not physically demanding and, to some extent, address a competitive need.

Dwight: Well sure. It has become more sedentary like the video games, two or three hours a day.

Julie: What prompted you to start doing that?

Dwight: I enjoy it. It’s available. It’s easy access to a variety of challenges. I like that aspect... I think it gradually increased, my use for [digital] games.

Mobility is also a notable consideration because most digital games do not require much physical movement and can be played while seated.

Engaging with digital games.

Benefits. In recent years there has been an increase in the amount of digital games designed to elicit full body movement, such as “exergames” (short for “exercise games”).

There were eight reports of interaction with such games. The Nintendo Wii is a gaming system that offers games with these features and four of the participants (all older gamers) shared that they played Wii games with their grandchildren.

When speaking with Paul, age 63, it was evident that his family is important to him. In fact, he shared that he brought his wife and three of his grandchildren to the interview so that they could hear his story. This may have caused a bias, as their presence may have influenced what he shared (or withheld) in the interview. It was not surprising to learn that he owns and plays with numerous platforms, including the Wii system, as he has been playing since his young adulthood years. I asked Paul about how he currently engages in play and he shared how he incorporates his digital gameplay into family interaction. Also, Paul shared that as he continues to age, he tends to gravitate toward sedentary forms of play, such as digital games.

Paul: Well, it's mostly on a computer, and on the TV, sometimes, like I got a Wii game. We bowl with the Wii game. We play baseball with the Wii game.... I got a little two-year-old grandson, first thing he come in and look at me, and says, "Papa, bowl." He takes the tablet and wants to go bowl with it. Certain other people [referencing to wife] like to play Solitaire and they take my computer away from me, too. So that's why I got me an iPod, they ain't going to take that away. I keep that and play it myself.

Julie: Is it becoming less physical?

Paul: Uh-hm. (Affirmative) More mental.

Julie: More mental, okay.

Paul: You got to think fast on some of the games, because if you don't, you could be messed up.

Julie: Now what is it that you get out of these games?

Paul: I get the pleasure of doing them and you get, you actually get hooked on it. You get hooked on certain games, you get hooked on you trying to beat it and it just beats you to death.

Another aspect related to the sedentary nature of digital games was that there was a general sense of appreciation in that they could play on a device, such as a cellphone or tablet, while reclining. This was the case with Trish (age 65), who shared that she typically plays on her cellphone (an average of 10.5 hours a week) and will oftentimes play at night before or while in bed. Similar to Rebecca, Trish shared how her nighttime routine of gameplay was not just a means to relax, but also a means to socialize and connect with her sisters.

Julie: And you'll play for like an hour or two hours, you said?

Trish: Yes. Because you do your turn, now if nobody else is playing, you're done until they play. But usually in the evening, like about 9:30, my sisters are all on, so we're all playing.

Julie: So it's like little family time together?

Trish: Yes.

Julie: Oh!

Trish: And we play with each other and we chat with each other. We complain, I didn't get any letters, you know...

Julie: Do you feel that it has, playing these games, has changed your life in any way socially?

Trish: Well, it keeps me connected with them, because otherwise, they're far away. And it keeps us more positive.

Disadvantages. Digital games are largely sedentary in nature, yet some encourage higher levels of physical interaction. This was evidenced by Judy (age 63),

who claimed that she would never play Wii games again because she injured herself (pulled muscles) once when playing. “Yes, and I pulled my muscles so bad I couldn’t walk. Honest to God. Yeah, we’d run into friends when we were out to dinner and they’d say, ‘What happened?’ ‘Bowling. Wii bowling.’ Now we use our Wii to stream Netflix.” As a result, Judy is fearful of playing Wii due to the threat of injury and now plays games on her iPad. Such concerns are noteworthy because the rehabilitation community has been actively investigating the use of physically interactive digital games, in particular, the Wii, to address therapeutic needs among older patients.

Digital games can be a source of valuable play for aging gamers, but consideration must be given to how such gaming may be actually inhibiting physical activity, particularly for those who have yet to experience significant mobility barriers. For example, when asked how digital gameplay may have influenced them physically, the younger gamers (and older gamers who reported high levels of functional ability) were more likely to express notions of disappointment and self-criticism with respect to their gameplay or gameplay options. There was concern that their gameplay lacked a physical component and that they should ideally spend some of that time on more physically engaging activities. Thus, their gaming is regarded at times as a hindrance to proactive, healthy movement, such as traditional exercise.

Jeff, a younger gamer, expressed how digital gaming does not benefit him physically, yet he recognizes the importance of maintaining physical health. Although he shared that he does not spend as many hours playing digital games as he used to in his young adult years, mostly attributed to his busy career in local government, he still

averages about 7 hours a week. Alternatively, he believes gameplay may benefit him cognitively:

Physically no, hell no. I should be out walking around and doing sit-ups. It's time I could spend working out and I don't because I hate it. (Laughing) I don't like to do it in the morning because I don't like to get all sweaty then go to work. When I get home from work, I'm tired. I don't want to mess with it. That is my own shortcoming. I think it [digital gaming] helps keep me engaged and active thinking so I think that it probably has some, I don't know what the right word is here, you know, benefits as far as...[some kind of cognitive effect].

Similarly, Mike (age 47) also expressed concern that his digital game interaction, which is completely stationary, inhibits mobility and physical activity. This is of growing concern for him because the nature of his career is largely sedentary. Mike averages 30 hours a week playing digital games on his computer. Although he makes an effort to exercise, he recognizes that the amount of time he spends playing games comes at a cost.

I have many nights when I sit at my computer and I say, "I really should get up and ride my elliptical tonight because I haven't done it a few days." And I get engrossed in the game and I don't do it. I did this last night. Actually, I was gaming with a friend of mine... We'd gamed for quite a few hours. And I was thinking to myself, "I need to ride my elliptical." And I didn't because I was having more fun gaming and I didn't want to stop, so I didn't ride my elliptical. So I am much less physically active than I should be. I do ride my elliptical quite often, stationary bike, and I walk my dogs every day so it's not like I have no activity, but I have less than I would if I were doing other. So that is a cost.

Overall, it was found that a decline in mobility influences digital game receptivity. It affords an opportunity to engage in a form of play that is largely sedentary, which is of benefit for aging gamers who have difficulty with or are limited by mobility.

Although this is advantageous for those who are experiencing this form of decline, digital gameplay can hinder physical activity for those who are otherwise functionally healthy.

Vision

Although there were a wide variety of concerns related to mobility, particularly among the older gamers, visual concerns in relation to digital gameplay were also mentioned in the interviews. It was found that declining visual acuity influences various aspects of game engagement.

Overall, there were only minor concerns about current levels of visual performance with respect to digital gameplay, yet visual acuity influences which games are selected and how they are played. Six participants shared how their visual acuity influences current gameplay.

Visual decline – digital game selection. A decline in visual acuity was a concern for both groups of participants. Three of the younger gamers shared that they have noticed visual decline in recent years and now depend upon prescription glasses to aid in their play. One of these younger gamers, Mike, plays on a desktop computer (large monitor) to accommodate for his steadily declining visual acuity. This decline has influenced game selection, as he believes he can no longer perform as well with previously enjoyed games.

I worry about that [visual decline]. I don't know. I read that my declining eyesight should drop. Should stop being so significant after, say, 50, more or less, a couple of years and that basically, I'll stabilize and decline will be much more slow. I hope that's true because it's been so dramatic over the last five years. I went from wearing no reading glasses seven years ago to wearing 2.0s now. And I'm considering upgrading. I need to upgrade to 2.25s or better. And you know, that's a huge decline over like seven years. So if that continues, 10 years from now, I'm

not going to be able to do anything because I'm going to be blind. For the moment, I can compensate mostly wearing reading glasses. And again, since I avoid playing, say, *Call of Duty* with 15-year olds because it frustrates me to get creamed.

Tammy (age 46) is another younger gamer who has issues with her vision. She has noticed a gradual decline in her vision since her young adulthood years and believes it benefits her to play role-playing digital games as opposed to fast-action combat games. Her preference for role-playing games is significant because they are purely text-based, meaning that they do not include graphics. Thus, this provides her options for adjusting the size of the text, as it is the primary means of relaying data (story lines) among the online players. In addition, she believes this kind of digital gaming is beneficial because it affords her the opportunity to review previous gameplay (via text) and prompts her memory on anything that she may have forgotten.

Julie: Do you think it [visual concerns] will become enough of a frustration to keep up with that, to be able to continue playing?

Tammy: Probably, which is why I like role-playing a lot more than combat. Role-play, you don't have to keep track of it as much. You can keep logs to remind yourself of what occurred. You could ask people, "Hey, do you remember this? Remember what happen with this?" That's why I like the game because the role-play is not as intense as combat at all by any means.

Visual decline – platform selection. In the previous section on mobility, it was noted that Rodney finds his desktop computer easier to manipulate than his laptop. Yet, he finds the adjustable features of the laptop useful, as he is able to angle the screen as needed to best suit his visual needs.

Julie: Has that [vision] been a problem for you?

Rodney: Uh, yeah.

Julie: With interacting on the computer?

Rodney: A little bit, yeah. I have trouble reading, and the laptop is easier to read, and I think the reason is because it puts it, it's in my lap and it's closer, the screen is lower and I'm looking through the right part of my glasses. Also you can judge the distance a little different.

Smartphones are a popular platform for gaming, yet visual challenges are encountered due to the size of the device. In particular, the size of the screen on a smartphone can make it difficult to view game features. It was previously shared how Trish uses her smartphone to play games with her sisters. She shared the frustration of having limited options with respect to purchasing a phone with an adequately large screen. The size of the screen influences her gameplay because some game features can be difficult to see, which causes her to use her glasses.

It's kind of small [smartphone]. I tried to get the bigger one. This was the biggest one when I got my upgrade... I play *Word*, and *Ruzzle*, and *Draw Something*... Then there's another numbers thing, but I don't like that one as much. Where is that? I have to put my glasses on because it's small.

Those who play games on their smartphones expressed particular concern about the size of their devices. These aspects related to vision were found to be of importance because there are considerable interactive limitations, such as options for zooming. In turn, the ease of making such adjustments influences whether or not a game is selected for play. Thus, if a game is found to be too much of a visual challenge, then it is abandoned and an alternative is sought.

Accommodating for visual decline. Due to years of exposure to computers in her former career as a teacher, Brenda regards herself as technology savvy. She has experience with a wide variety of game platforms ranging from computers to smartphones. This has contributed to her knowledge of how to manipulate features to improve interaction. When asking about platform use, I learned that she prefers to play with her iPad because it affords options that better suit her visual needs.

Julie: You played them both on your iPhone and your iPad.

Brenda: Uh-hmm. (Affirmative).

Julie: Do you play it more on one than another?

Brenda: Since I got my iPad, I've been playing on that much more.

Julie: Why?

Brenda: Because of the size of it. This [referring to her iPhone] is just so frustrating and now I forgot my iPad, it's like, "Whoa!"

Julie: Your iPhone is frustrating; like how is that?

Brenda: Because it's so small... It's just more intense on the iPhone. If I find that I'm in the car, I'll play on my iPhone because that's what I have, but you can expand the screen, I know.

The computer was also discussed in terms of options for adjusting the size of features within a game to improve visibility. This know-how was more often expressed among the younger gamers and, based on the interviews, this is likely attributable to familiarity with the technology due to greater amounts of exposure. For example, Mike shared some of the specific visual challenges he faces when playing digital games on the computer. Although he is able to make some alterations, such as the resolution of the

graphics, he is unable to adequately address the size of the font in the games. In addition, some of the digital games are a challenge because they are visually cluttered, meaning that there is too much visual stimuli within the game. This is also related to cognition with respect to attentional demand.

I definitely use reading glasses when I game. I find I like to sort of recline when I game in my chair, sort of lean back like this and game. And I find I frequently have to sit up because I can't read the screen, so I have a lot more problems in some kinds of games. Some games are not very good at adjusting font sizes.

So if you, say, run the game at high resolutions, the graphics look good. The graphics all scale so things are still the same size or just higher resolution, but all the text gets really small. And that can be very frustrating because I can't read it unless I lean up to the machine.

So there are games out there where I actually can find it very hard sometimes to identify what's going on on the screen because of the complexity that can now be shown with high-end... you know, high... modern processors and graphics quality.

Mike's concerns warrant further investigation, as options for adjustment need to be made available. This takes into account the needs of the user, as well as the needs of potential users. In addition, there is a clear challenge to identify ways to improve the visual graphics of a game without sacrificing features, such as text. Furthermore, it was previously suggested that the younger and more experienced gamers were more familiar with how to make adjustments within a game, such as those related to graphic and text size. Although this know-how is likely to become more common within subsequent aging gamer cohorts, this poses as a barrier for those who are not as familiar with gaming technologies, such as older gamers.

Both sets of participants shared concerns about visual problems that they may encounter at some point in the future and how this might affect their ability to interact with digital games. When asked if she believes she may encounter a physical limitation that would interfere with her gameplay, sixty eight-year old Lola (a *FreeCell* enthusiast who plays for about 14 hours a week) shared that she is concerned about potential visual decline.

I'm probably going to have to have cataract surgery in the next couple of years, but that has become such a normal kind of thing. Mother has macular [degeneration], as I think I mentioned and so far, although both of her siblings had it as well, and maybe her mother, none of us seem to be struck with it. So that is my, yeah, I've got one of those grids, because I go every year to get my eyes adjusted and that sort of thing, and so far I can see all of the whole thing without any blank spots, so I thank my lucky stars.

Negotiating anticipated visual decline. The notion of not being unable to play (digital and non-digital forms of play) due to visual decline was found to be distressing for participants, such as Lola. Tom, at 77 the oldest gamer, provided descriptive insight regarding the importance of vision in relation to play as he ages: "I hope I am disabled by the time I lose my eyesight because if I can't read, I can't stitch, forget it. You know... That means I can't use the computer; I couldn't be doing jigsaw puzzles. Forget it. Shoot me. Put me out to pasture." When Tom said this, I was initially taken aback over the seemingly extreme nature of his comment. Perhaps it is necessary to hear such forthrightness in order to grasp the significance of not just functional vision, but the value of play in old age.

Those who regard digital gameplay as a significant source of play expressed greater concern for visual barriers related to game interaction, whereas those who do not

rely upon digital games as much as a source for play had more concern for how visual decline would affect other aspects of personal play, such as reading and knitting. With this in mind, if the design of digital games does not become more visually accommodating, then it may directly affect whether or not the game will be played by users who experience or will experience the impairment. This may affect the younger gamers, as they have relied longer upon digital games as a form of play than older gamers.

Response Time

Another functional factor that influences gameplay is response time. Not all digital games are timed and dependent upon the response time of the player; in other words, the player is not required to respond to a stimulus within the game within a set timeframe. Traditional games, including card (*Solitaire*), word/number puzzles (*Sudoku*), and board games (*chess*) have been adapted and converted into digital versions. These games typically permit the player to go at their pace and there is a low-level of stimuli in these games. This means that the game features are static; there is minimal movement of objects within a game.

Action and casual games are another category of digital games, yet they differ from traditional games because there is typically some degree of response time necessary for success within the game. Action games reported as having been played by participants typically had a strategic combat/military component. Casual games do not always have a timed response component, yet the preferred casual games mentioned by participants have some degree of response time requirement (i.e., *Bejeweled*, a timed matching game).

These game categories are noteworthy within the context of response time because neural impulses decrease with age (Salthouse, 1985) and these influence game interaction. Participants were asked if their personal game preferences and games were categorized as traditional, casual, or action. All but two of the older gamers (Paul - action and June - casual) expressed a preference for traditional games (i.e., *Solitaire*, *FreeCell*, *Sudoku*). It must not be assumed that there is an association between the age-related decline of response time among the older gamers and their preference for traditional games. The older gamers did not express concerns related to response time within their game, yet it may be suggested that age-related delays may hinder engagement with (or a preference for) timed games.

Five of the older gamers (all female, ranging in age from 63 to 66) shared that they play both traditional *and* casual games. June was the only gamer to express a preference for casual games only. Although card games were reported to be very popular among other older gamers, she shared that she did not care for them: “I never played *Solitaire* or cards of any kind much. You had to think too much to play cards.”

All of the younger gamers reported a preference for action-oriented games. Success with these games, to some extent, is dependent upon how quickly the player responds to stimuli within the game. These games are either combat-based (played by 8 of the younger gamers) or are classified as a casual game (played by 5 of the younger gamers). Two of the younger gamers (Betty and Patty) reported playing both combat and casual games, but have a greater preference for casual games.

Three of the younger gamers who play online multi-player action games shared that this delay in response time has influenced their gameplay to the extent that they have

become more selective with which games they play and whom they play with/against. These games are typically marketed to a younger audience, yet most of the younger gamers interviewed began playing these games years earlier (before they began to notice a decline in their functional ability). The younger gamers still prefer these games, yet find it challenging to play against even younger players. This prompts frustration and can even influence social connections with persons with whom they play, such as the situation with Randy playing against his daughter and online friends.

Randy, age 55, was a teenager when he began playing digital games. Although they were primitive by today's standards, Randy continued playing them throughout the years. When asked, he expressed a long-standing preference for action games and continues to play them today.

Randy: First-person shooter games and any kind of strategies games. I still like them type of games.

Julie: Why is that?

Randy: Strategy because it's competition against somebody else, first-person shooter because you're killing stuff. You're going back to your childhood, playing Army or cowboys and Indians.

A gamer for almost 40 years, Randy continued to share his story of how he has noticed a decline with some of his functional abilities, such as vision in relation to response time.

Randy: When she [daughter] got a little older we played ... she would play a little bit of *Halo*, what was that *Men of War* or I forgot what. There was one game on Xbox that she would play and I tried to play with her. The younger people, their reflexes are 10 times faster than mine. [Laughing] I couldn't hardly keep up.

Julie: That's interesting points. Did you notice over the years that your response time to stuff...?

Randy: As far as seeing, yes. They would see things 10 times quicker than I could see it.

Julie: Interesting. Did that affect how well you were able to compete?

Randy: Oh, yes.

Julie: You noticed that?

Randy: They were killing two to one. Or if we were playing versus she was killing me before I could even see her.

Julie: With that change that you have noticed, do you think that's the kind of thing that will continue as you age?

Randy: Oh, yeah. Oh, yeah. I'm sure my eyesight's getting worse and my reflexes are not as good as they used to be.

When asked how this gradual decline may affect him if it eventually prohibited him from playing, Randy responded that it would influence his social circle. He has been playing online for years and has had to recently adjust to games that permit more time to respond within the game. In turn, this affects his social network.

Yeah, I would miss it. I'm not going to lie, I enjoy it. It's a getaway. In this game you do interact with other people. We have a group called Alliance, so I get to talk to them on the chat. It's like you get to chat and stuff like that, so I would miss that little part of it.

Similar sentiments were shared among other younger gamers in that they have felt pressured to seek alternate games that do not emphasize reaction time or, at a minimum, provide some kind of prompt to alert them for the need to react. Mike has experienced similar situations to Randy. Although he averages 30 hours of gameplay per week, he

has found himself being more selective in what he plays due to a noticeable delay with his response time.

But we [online gaming friends his age] don't like to go online and play with pickup groups because pickup groups are usually 15-year olds or 20-year olds and they cream the floor with us because we're all slower, we're all old... We started playing these games in college. And then, we gradually moved into these modern games as they became available. But these young kids that were trained on these games and still have young reflexes are really way better than we could ever be at 50 years old playing one of these modern action games... If I go into multiplayer games, I'm always going to get creamed.

And that's going to frustrate me and I'm going to decide to play something else because I don't like getting creamed all the time. It's not that I mind the losing. I don't actually care about the losing. I do mind getting stomped. Not stomped once. Stomped *all* the time, so I pick the games I play that... I'm capable of being good at. Good enough at that I'm enjoying myself.

Six of the younger gamers play online action games. Yet, as these younger gamers begin to notice a decline with their visual acuity and response time, they are prompted to change their game playing behavior. Just as Randy and Mike shared, there is pressure to select alternative games that are more accommodating to reduced ability. Randy shared frustration with finding suitable games and how he believes the gaming industry is not paying attention to the functional needs (visual and response time) of aging gamers. Because he does not know of many alternative options, Randy will still play online action games, but is confronted with age-related remarks from younger opponents.

Julie: Do you think that the gaming industry recognizes that there are persons like yourself that play a fair amount and that they're aging?

Randy: No, I don't... Guys like me can't compete with the younger people. There's no way. We can't see, we can't react as fast... I know that online gaming and playing against everybody else is great, but they [the gaming industry] need to make the games more stuff that you can do without having to go online to play against somebody else, or have an older division or something, I don't know, something like that. That could be "you need to be 45 or older to be playing this thing."

Julie: Right. Those are really good points. I'm just wondering if the game companies... even know the preferences of your...?

Randy: A lot of gamers mostly are younger, I'd say 30 and younger probably people, so that's where they're going to gear it to. Even in my game that I play online, when I tell them I'm 55, "Good job, old man," [sarcastic] something like that. A lot of them are 14- or 15-year olds we're playing against.

Julie: They call you "old man" and you're only 55?

Randy: They call me "old man" but they're kind of shocked that I'm playing at 55. I'm hesitant sometimes to tell people that too... I don't want them to know that I'm so old still playing the game. I don't know if I feel a little silly or something like that, especially when they're teenagers and stuff like that playing.

Although response time did not seem to be an issue for the older gamers, and may explain the preference for untimed games, it was also evidenced among the younger gamers as a growing concern regarding their future gaming activities. The relationship between game preference and response time merits monitoring in the coming years, as a continued decline in cognitive abilities may inhibit gameplay of aging adults if suitable accommodations are not made available.

Dexterity

Finally, participants expressed that a decline in dexterity, specifically issues related to arthritis, influences digital gaming. Ten participants shared that they have arthritis in their hands and that it interferes with various forms of play and not just digital gaming. For example, June is one of four participants who knits. When I asked her if and how age-related impairments may influence how she plays, she replied, “It probably will. But I still think that I will continue. It’s just like knitting. I notice that my hands are stiff from knitting and that I have arthritis in my hands.”

Although arthritis was reported among the older gamers, one younger gamer, Betty, shared that she, too, suffers from this ailment. Betty (age 53) works in an office setting and much of her job involves the use of the computer. In her interview, she relayed that she has already experiencing dexterity problems in relation to gameplay and it was the primary reason that she had to abandon her home console system. The movement required with the console’s controller became too painful for her to continue.

Betty: ... There’s so many more buttons on these controllers now and getting your hand and wrist to do something long, for long periods of time is tough.

Julie: Is it so much that there’s so many buttons and you don’t know what goes what and what this button does or is it a matter of trying to manipulate the button, the dexterity of it?

Betty: I think it’s the dexterity of having your hands go to sleep because you’ve been doing it one way for so long or ... yeah, I think as you get older, you get the carpal tunnel, you get arthritis... Knowing that this guy needs to jump to this cliff and this is the key function to make him do that, getting my hands to do that in fast mode and in a repetitive manner without causing something to fall asleep, something to hurt.

Concerns such as Betty's can interfere with manipulating hand-held gaming devices, including components such as remotes and controllers. This includes platforms such as a smartphone, computer mouse, and home console system.

Two of the participants who reported arthritic difficulties (Judy and Yvonne) shared that this has influenced their platform selection. Judy (age 63) was diagnosed with rheumatoid arthritis at the age of 29 and has noticed it more in recent years. She used to rely upon a desktop computer, which was relocated from an upstairs office to the ground level to alleviate mobility concerns (artificial hip), but now enjoys an iPad tablet for games. She enjoys the portability component of this device. Because I was aware of the arthritis in her hands, I was initially surprised by her response when I asked her if she could foresee any issues that would influence her interaction with the iPad. Her first response was "no," so I further questioned her.

Julie: Any age-related challenges you might come across that would be a problem?

Judy: No.

Julie: You don't have concerns with the arthritis in your hands or anything, with being able to manipulate?

Judy: No, I use a stylus most of the time.

Judy's use of the stylus (a pen-shaped input tool used to select items on a touchscreen-enabled device), suggests that there is an awareness of assistive technology devices for platforms. This consideration merits further exploration among older gamers who currently use or may benefit from these aids, as they could be critical for continuing digital interaction.

Although only one younger gamer reported having arthritis, this may be an issue for younger gamers as they continue to game into old age. They typically play on computers (with a mouse for greater control of movement) or on smartphones for casual games. Prolonged use may exacerbate arthritic pain or poor motor control may jeopardize gameplay. Therefore, to accommodate to functional needs, both software and hardware modifications must be explored to minimize error. Some alterations related to movement of the mouse can be made on current computers, yet these changes may not transfer to the game.

A younger gamer, Shauna, was introduced to digital games when she immigrated to the United States from Europe as a college student. She shared that she quickly took to computer-based games and although she was a newlywed who was busy with graduate school and a newborn, she spent as much time possible playing. Currently she is a divorced single-mother, is employed through a local university, and is working on an additional degree. Without spousal support, these responsibilities have decreased her amount of digital gaming playtime to approximately 2 hours a week. Although she does not play as much now, Shauna recognizes and appreciates how a decline with functional ability may influence a gamer as they age.

I mean so you just get worse at those games which then I guess would mean that eventually you're going to stop playing though because it's not fun anymore because you can't beat your own scores.

This sentiment expressed by Shauna was more common among the younger participants, such as Mike and Randy, as compared to the older gamers. The younger gamers expressed a greater sense of frustration and/or disappointment with current challenges to play, yet some remain hopeful that these functional concerns will be

addressed by the gaming industry in the coming years. Bobby, a 44-year-old software designer and avid gamer who plays for about 16 hours a week, has been monitoring the gaming industry for years. He reported that he regularly reads articles that pertain to game development and industry trends. Bobby believes that game developers will eventually turn their attention to the needs of aging gamers for financial reasons.

Julie: Do you think that the gaming industry is aware of age-related challenges with respect to function and interacting with digital games?... Like for yourself as you start to encounter little things into your 50s and then 60s and 70s. Are they aware of these kind of things and how to design for that do you think?

Bobby: If they are I don't think they care unless they're Nintendo. Nintendo is trying to reach into the home for everybody although the target market is still young families and children. They're more about the physicality of the Wii mode and they like people to exercise. They like the idea of that little balance board because they're trying to hit you on different levels and engage different people. I think just about everybody else the target market is still young males with disposable income. They're starting to see a richer bounty from older males who are single, but have lots of disposable income but it's still not trying to rise to meet that challenge.

Julie: You think they don't care more from a financial standpoint?

Bobby: Correct.

Julie: If it became more financially advantageous for them, you think that's when they're going to start hopping on that bandwagon then?

Bobby: Absolutely. When my generation gets into its 50s and mid 50s they're going to start seeing that we're still big supporters. Either that or we're all going to collectively give it up because something will happen that we can't stand. I doubt that's really going to happen. I think the reason that's probably not going to happen is even the people that aren't very hard core about gaming or say, "Oh,

I did that when I was younger and I'll do that a little now”
are being drawn in by casual games. Casual games are
hitting everybody especially when they're right here in
front of you on your phone.

This chapter explored and discussed the findings of Specific Aims I and II.

Consideration of Specific Aim I provided evidence of the significance of the life course perspective, as age- and cohort-related themes emerged. This included the importance of and preference for various forms of play at different stages of life and how this was represented in digital gaming. Analysis of Specific Aim II highlighted the relationship between age-associated abilities and engagement with digital games. When assessing the findings of Specific Aims I and II in tandem, the outlines of a theoretical perspective begin to emerge. Chapter Five will synthesize the themes by introducing a theory that integrates the domains of motivation, experience, and ability within the context of individual gameplay.

CHAPTER FIVE: TOWARD A LIFE COURSE THEORY OF DIGITAL GAMING

Findings for Specific Aims I and II provide a framework for understanding the factors that influence senior digital gaming. The role of motivation, functional ability and experience in the context of transition in the meaning of play over the life course serve to create three domains that function in concert to represent gaming in old age. This resulted in the preliminary generation of theoretical perspective on senior digital gaming.

Findings: Specific Aim III

Aim III – *To develop a theoretical perspective on digital gaming in old age.*

Toward A Theory for Senior Digital Gaming

Engagement in digital gaming in old age is a life course extension of play that is a function of a person's motivation, experience, and ability. Specifically, this refers to the strength of an aging gamer's 1) *motivation* to play digital games, 2) *experience* with digital games (including platforms) and 3) *functional* ability to interact with the digital game. This theoretical perspective is presented in the form of a hypothesis; it provides a framework for understanding the primary contributing factors that influence digital gaming among aging gamers and is shaped by the individual's evolving conceptualization of play throughout the life course.

Domain #1 – Motivation. This study has provided evidence that aging gamers engage in digital gameplay for a range of reasons that in many cases change over the life course. This means that the strength of a motivation may fluctuate depending upon immediate needs, preferences, or circumstances. For example, a player may report that they engage in a game because it is enjoyable; yet something may influence them to play

for an additional or alternate reason. Gaming motivations may evolve as a result of life course factors, such as the desire to maintain cognitive abilities or nurture a relationship via gameplay.

A wide variety of motivations was reported by the participants and can be situated within one or more of the following eight categories.

Enjoyment/Fun. When asked why they play digital games, “enjoyment” and “fun” were the most common responses. Rebecca expressed “fun” as her primary motivation for playing her preferred game, *Words with Friends*. She also indicated additional reasons, including cognitive maintenance and socialization. Because she was immobile when she was first introduced to digital games, this may have influenced the strength of these motivators.

It’s just fun. And I like stimulating my brain and you know, these are all good friends. My daughter, my granddaughter, my best friend, you know that play. So and then at the same time you can keep in touch with them. I mean, it’s almost like you are there with them because it is instant when you write and they instantly get it back and you are sitting in the same chair. It is just really convenient.

Continuance of a traditional form of play. Other participants expressed a preference for particular digital games because the game was a digital version of (or similar to) a non-digital game they once enjoyed. The relationship between games played in childhood and digital game preferences in advanced adulthood is a life course notion that was common among participant responses. For example, Loretta shared that she learned to play the traditional card game *Solitaire* as a child and has played it for most of her life. She now prefers to play the digital version on her laptop because it provides numerous options of different versions of the card game and she does not have to shuffle

the cards. Loretta feels this particular aspect is important because it eliminates the chance for human error.

Before, when I played *Solitaire* [non-digital], you have to play all these different varieties or else your cards, they just got stacked. I don't care how much you shuffle them, you really need to do something else with that deck before you went back to playing the game you really liked to play. With Mega Solitaire, you don't have to do that. The computer does it for you.

Socialization. As noted previously, Rebecca indicated that she enjoys the socialization that occurs when she plays Words with Friends because it affords an opportunity to connect with family members and friends. Trish expressed a similar motivation in that she regards social forms of gaming as a means to nurture relationships. This is a critical motivator for her because she always previously lived with other people (family) although she now lives alone. Trish seems to enjoy the solitude of her new living situation, yet is appreciative of how she is able to maintain important social connections via her digital games.

I'm more alone now that I live alone. And my kids are all doing their own thing, and everything else. But I still have social [needs], although now I appreciate my alone time more than before. But I didn't really have alone time before. Now I kind of have it, and I'm kind of liking it. So, yes. And I'd rather be alone, home, comfortable in my bed, playing *Words with Friends* with you on the phone instead of coming to my house when I have to be dressed and sit down at the table now. So that's one of the reasons why I like to play the games on the phone, except I'd rather be home, comfortable in my pajamas.

Escape. There are various ways in which escape can be a motivation for playing digital games. Findings indicated that this motivator typically stemmed from a stressor, such as coping with the death of a loved one, as was the case with Tammy. Tammy

shared that if it were not for the death of her brother, she would not be playing now. When she learned that he had cancer, she began playing digital games with him as a means to nurture that relationship. After his passing, her motivation included reminiscence because she viewed gaming as an opportunity to remember meaningful moments with her brother. At the same time, she played (up to five hours a day) to escape the pain of dealing with his death. Now, as a single mother, she plays to escape the stresses of her family and career.

Tammy: That [gaming] was a way for us to hang out and be together and do something fun for him, fun for me, talking and interact... But not focus on the cancer.

Julie: Would you still be or would you have played at all [digital games] if it weren't for that [brother's death]?

Tammy: That was really a very life-altering experience. Probably I wouldn't have been playing these games at all. Because when he first introduced me to the games back in '96 or '97... I played while he was there because we were playing together. He was sitting at one computer, I sat at another computer. He was walking me through it, how to play. He was showing me. When he left I didn't really play after that. I didn't have time, I didn't take time.

Julie: Yet after he passed, you said you continued playing?

Tammy: Yeah. That was very much an escape in part. Another part is it was a way for me to think about him or not think about him being dead. That was really depressing when he died. Even though I knew it was coming, I knew it. It still was very depressing. Rather than self-medicate or do any number of other distracted sorts of things I could have done to try and stay off the depression, I chose to escape by playing video games.

Julie: Okay. Playing of games, what it does for you now, is it different? Before you said it was a form of escape and a way to handle things. What about now, how do you benefit from it now?

Tammy: It's still a form of escape because I have a stressful job. I do have a stressful job. There's nothing thrilling with all of these zeros and ones. They're all lined up. It's just nice to be able to go and do things with a sword, but you're not really doing it. Because that is definitely a form of venting aggression (laughing). It is a form of stress relief and a form of escapism.

Reminiscence. Similar to Tammy, there is an element of reminiscence when Katy plays digital games. She was close with her father, a sports enthusiast. Watching sports was something they used to do together. Although she expressed that she was not much of a sports fan before his death, she found sports-themed digital games as a means to spur memories of him.

The other thing is, once my father died, I started watching a lot more sports, because that was one of the things that he and I used to do, we would watch movies and we would watch sports together. I think when he died, I kind of, like, sports ... got a lot more into sports as a way of feeling connected still to him. So, that takes up some of that more fun time is actually watching sports and doing things like Fantasy Football games... those kind of things.

Something to do – boredom. Another motivator is boredom; gaming is viewed in some cases as an activity that merely passes the time. The younger gamers did not express this sentiment, which is likely attributed to their limited amounts of free time. Jerry, age 63, averages 7 hours of gameplay a week and will sometimes play *Words with Friends* against his wife. Although he expressed a social-based motivation to play, he also shared that digital game playing was something he did in the absence of more desirable activities.

Julie: What's motivating you to play these [digital games]?

Jerry: A lot of times just boredom. Something to do when I don't want to get up and do something or there's nothing on the tube, or I don't have a book that I'm really into. I'll

tell you this first, if I find an author that I really like and I'm reading his books that time infringes on the digital games.

Competition. Some persons have a competitive nature and findings indicated that, for some, this can be fostered via game engagement. Brenda expressed that she enjoys finding new games and downloading them onto her iPhone. She makes a point of playing them at the beginning and end of each day and revels in the challenge of beating the game (“getting to the end”). This speaks to her competitive nature and prods her continued engagement.

I played that when I was really young. I like games where there is no ... there's no really obvious outcome. I'm very competitive when it comes to those, too. Oh, man. That's an interesting thing. When I think about games I can get really tied up and knots with games because I'm so competitive with them and I want to be the one that wins. That's why I'm having so much trouble with this *Candy Crush* because I can't get to the end of it. That's really killing me and I want to get to the end of it.

Cognitive maintenance. Although it seems that many of the digital games marketed to adults emphasize cognitive maintenance, this was the least common motivation expressed in the interviews and was never mentioned as a primary motivator. Todd, age 65, used to be an avid gamer, but now plays for approximately 15 hours a week. He shared that he recalled his parents playing puzzles frequently in their old age and believed they did that to maintain cognitive function. His mother was later diagnosed with Alzheimer's Disease. With this in mind, I asked if his motivations for playing games stemmed from a desire to maintain cognitive function.

I also do it [play digital games] partly to try to keep some sort of cognitive effort going on or maybe to measure cognitive decline ... I think that's a side benefit. I think to some extent, maybe it's just a typical thing for our

generation or our society but it's almost the multi-tasking thing. I will be watching television and playing the game of *Sudoku* at the same time. I can sit with it on my lap and do that and watch TV and pet the dog, it keeps me occupied.

Domain #2 – Experience. The participants expressed a variety of reasons for digital gaming, yet motivating factors alone do not provide a complete or holistic perspective on their engagement in digital games. Rather, motivating factors interplay within a larger life course context with other domains as they continue to be redefined in advancing age. *Experience* is one of these domains and refers to the amount of personal experience with digital gaming that is gained over time. This experience is shaped by the frequency of exposure and engagement with digital games (including gaming platforms) over the life course. In turn, this experience influences individual levels of self-efficacy with digital technologies and helps to shape digital game preferences.

It was found that the more gaming experience a participant had, the more likely they were to rely upon digital gaming as a primary source of play. I hypothesize that this accumulated interaction over time increases levels of technological self-efficacy and confidence which, in turn, aids in learning new technologies and interactive features. This consideration is critical as technology development is continuously advancing.

Experience levels varied among the participants, yet findings indicated that there is an association between this domain and four key variables.

Age. The age of the participant was the most salient variable that indicated a strong association with high levels of experience. Age is not a causal factor, but suggests a potential cohort effect between the youngest and oldest participants with respect to frequency and exposure to digital games. As first discussed in Chapter Two, early versions of digital games were released to the public in the late 1970s and became a

popular form of play among younger age cohorts in the 1980s. The younger gamers who reported the largest number of hours playing digital games were first introduced to these games in their youth and have continued playing them ever since. This means that this will be the first senior gamer generation that began playing digital games in childhood. It is also worth noting that these gamers, as compared to the older gamers, expressed a greater sense of reliance upon digital games as a valuable and significant form of play. The younger gamers also intend to continue building upon their experience, as evidenced by the desire to continue playing. For example, Mike, who will be approaching retirement within the next 15 to 20 years, has already considered how he will continue playing digital games in the coming years as he approaches old age.

I've had periods where I've been totally engrossed in the game and I think to myself, "If I were retired, I could just play this game every day. And wouldn't that be awesome?" And I think that. I really did. It goes through my head that this would be so cool. It's like I should start thinking about when I do retire. It's like... You know, I actually have plans after retirement so I won't have any problems when the time comes, I hope, but I start thinking about, "No, I can retire earlier than I could..."

In addition, younger gamers expressed concern of encountering a situation in the future that negated their experience and prohibited game play. Mike spoke to this notion by relating the absence of gameplay to his perception of quality of life when residing in a nursing home.

I had a friend whose father was in a nursing home recently. And one of the things I learned from that experience was how horrible nursing homes are and how... If I were in the nursing home, I don't know what I would do, you know, because all anyone does is sit around and watch TV. Mostly, that's all they do. And I don't do that as part of my life... And you know, I'd go crazy because I don't know what I would do so... Who knows?

Time availability. Related to *age* is the notion of time availability as a contributor to experience. Findings indicated a trend with experience and time availability for play. For example, as discussed within Aim I, the participants reported ample amounts of free time for play during childhood years, but the availability of time decreased as responsibilities to career and family increased. As career and family commitments decreased during the latter part of middle adulthood and older adulthood years, it was reported that time availability for play increased. This typically occurred with retirement and when grown children moved out of the house.

This perspective of time availability does not equate to increasing amounts of time spent game playing as one ages. To the contrary, younger gamers, all of whom are still employed and most (81%) have children within the home, average more hours of game playing per week as compared to the older gamers (11.6 hours vs. 11.00 hours). This is not a causal relationship and does not suggest a significant difference, yet it brings to question how free time is spent playing at different stages of the lifespan and attributes to experience.

Both sets of gamers found opportunities for play (free time) during their younger and middle adulthood years, yet the younger gamers were introduced to digital gaming at a young age and have continued engaging in it as a form of play as they grow older. Exposure early in life provided increased opportunities to gain experience. Much of this is also attributed to the feasibility of gaming, as mobile platforms became more common and integrated in the lives of younger age cohorts. This gaming option (digital gaming, or at least mobile digital gaming) was not readily available to most of the older gamers when they were in similar stages of adulthood. Limited exposure decreased the

opportunity for gaining experience; this, in turn, influences their competence with digital technologies.

Career-related familiarity. All but one of the older gamers expressed that they were comfortable with gaming technologies. Participants typically attributed this to a career that emphasized the regular use of computer-based technologies. The skills acquired over time were transferred and applied to digital game technologies. For example, one of the oldest participants, Jake (age 76), did not grow up playing digital games like the younger gamers. Rather, he began working with some of the earliest computer models at the Kennedy Space Center and assisted with the Apollo program. This led to additional computer-intensive jobs until retirement and provided a rich technological foundation based on years of experience.

Access. A final element found to influence experience was access to gaming technology. This can be viewed on both a societal and individual level. As previously mentioned, digital games became increasingly common in American society beginning in the 1980s. Digital games were largely marketed to younger populations at this time and the younger gamers reported that this influenced their exposure and access to them as early as late childhood.

Older gamers were also exposed to digital games during this time. Eleven of the older gamers shared that digital games were within their home for many years because their children played them. Although not all of them reported playing these games (or at least played as much as their children), they were exposed to digital gaming and this increased as new gaming systems were adopted into the home.

Access to digital games as a contributor to experience also includes current and anticipated future access. For example, all of the participants own at least one platform for gaming, yet some own multiple devices, including a smartphone, tablet, *and* computer. Ownership of multiple platforms was more common among the younger participants. These additional means to access games may increase the opportunity for game play experience. Alternatively, if one were to have had limited access, this may affect how much they were able to play. This can be influenced by the continuous advancement of technology and the availability to gaming platforms within one's living environment, especially in advanced age.

As previously discussed, new technologies have become increasingly advanced and sophisticated. Yet an older adult, particularly one with limited experience (e.g., Rebecca), may not be able to keep up with understanding how to operate newer platforms, especially in the context of challenges posed by age-related decline. In addition, a senior gamer may need to relocate at some point due to declining health. Their next residence, such as an assisted living facility or a nursing facility, may not accommodate for this need.

Domain #3 – Ability. The participants expressed varying levels of functional ability, referred to here as “*ability*,” and different sentiments with respect to how their perceived functional ability level influenced the extent to which they were able to engage in digital gameplay. A noteworthy trend emerged when assessing age and ability levels. With respect to gameplay, the younger gamers expressed fewer limitations that were attributed to current functional ability levels. In contrast, there was a greater amount of

concern among the older gamers, as they all reported decline in at least one functional ability.

Declining physical ability was not associated with reduced time committed to digital gaming. Rather, there appeared to be a fine balance between the two in that digital gaming may afford the older gamer an opportunity to engage in a form of play. This was appealing to those who have physical limitations, as most digital games require minimal physical effort. For example, when Rebecca was immobile for two months, she appreciated having digital games as an option for play. This suggests that decreased physical capability can create a context for digital gaming.

On the other hand, there is also a negative association between reduced ability and gaming. Ability may decline to the extent that gaming interaction becomes too much of a challenge or becomes impossible. Although none of the participants reported compromised physical and cognitive ability levels that completely precluded game play, concern was expressed for anticipated decline, especially in vision and manual dexterity. This concern was more common among the younger gamers, such as Mike, who is already having to adjust to declining vision.

I'm sure for the faster pace, the action games I play, I am probably declining in performance because I can't see things the way I used to... So I think it's going to become a bigger and bigger problem as I get older.... It's just something I'm going to have to deal with as I get older.

As noted in the discussion of findings with respect to Specific Aim II, cognitive ability was not reported as a hindrance to gameplay among any of the participants, yet the potential for decline is of some concern among the older gamers. This was of particular concern among those who have or had a relative (usually a parent) diagnosed with

dementia. Although this may prompt one to speculate that cognitive maintenance may be a primary motivator for game play among the older gamers, this was not supported by the findings. None of the participants were aware of any causal cognitive benefits of digital gaming, yet there was an assumption that there might be an association between the cognitively challenging digital games and the promotion of cognitive health.

Synthesizing the Domains

Findings from the interviews provide evidence that the three domains – motivation, experience, and ability – play a critical role in creating a context for digital game play as the gamer ages. The function of these domains does not remain static, but shifts throughout the life course and, in turn, influences the propensity for gameplay.

Each domain has been individually discussed, yet they function in concert. When considered through a life course lens, a more holistic perspective emerges. This viewpoint gave shape to the findings and resulted in two overall propositions.

Proposition #1 – *As a senior gamer’s level of ability declines, they become increasingly reliant upon their level of experience to compensate.*

The more experienced the gamer is, the more likely they are to know how to make appropriate modifications to a digital game (or platform) when confronted with age-related limitations that affect their ability to engage in the game.

Tammy, who plays text-based action games, demonstrated this as she shared how she changes software settings in her games to accommodate for her impaired vision. She utilizes her high level of gaming experience to meet the needs of her declining ability. Tammy values her engagement with digital games and plans to continue as she ages (high level of motivation). Thus, she may become increasingly reliant upon digital games as a

valuable source of play as former play options become less feasible as age-related abilities become compromised over time.

That's certainly something any user can do with the software that you use to MUD [multi-player form of gaming]. You can change the colors to make ... You can change, customize colors all over it. Absolutely. Have I done that? Yes. I sure have. I've changed my settings so that I can see certain things better. The colors alert me and I know, "This color is always this and this color is always this," for myself.

I hypothesize that as an aging gamer experiences increased levels of functional decline, they will be more apt to draw upon their accumulated knowledge of gaming experience. Yet, this becomes problematic if the aging gamer is challenged with technologies that surpass their experience or their ability levels decline to an extent that they are prohibited from playing. This highlights the dynamic nature of the domains and the potential for their instability. As limitations mount for an aging gamer, gameplay becomes hindered regardless of their level of motivation. Ultimately, this influences the gamer's quality of life.

Proposition #2 – *Play becomes increasingly sedentary with age due to declines in functional ability and may limit options that satisfy play preferences established in childhood.*

As demonstrated within the findings, digital games may be a viable option for play in advancing age. Participants reported functional decline over time and, as a result, play became more sedentary. Digital gaming may be perceived as an increasingly viable option due to sedentary constraints, yet the motivation to play is partly influenced by well-established play preferences. Play preferences are established and refined throughout the life course and the propensity to engage in digital games is influenced by

the continuance of play preferences. If this is a strong motivator for the gamer, their ability to continue playing into old age may become compromised due to increased impairments.

This was demonstrated by Randy and Mike in the previous chapter. They have been playing action-themed digital games for most of their lives and indicated a desire to continue playing these games. They also noted declines in functional ability (e.g., response time), which have influenced them to seek alternate gaming options. This was not a welcomed change, as they are less familiar with these games, and do not believe that there are adequate options available that meet their functional needs.

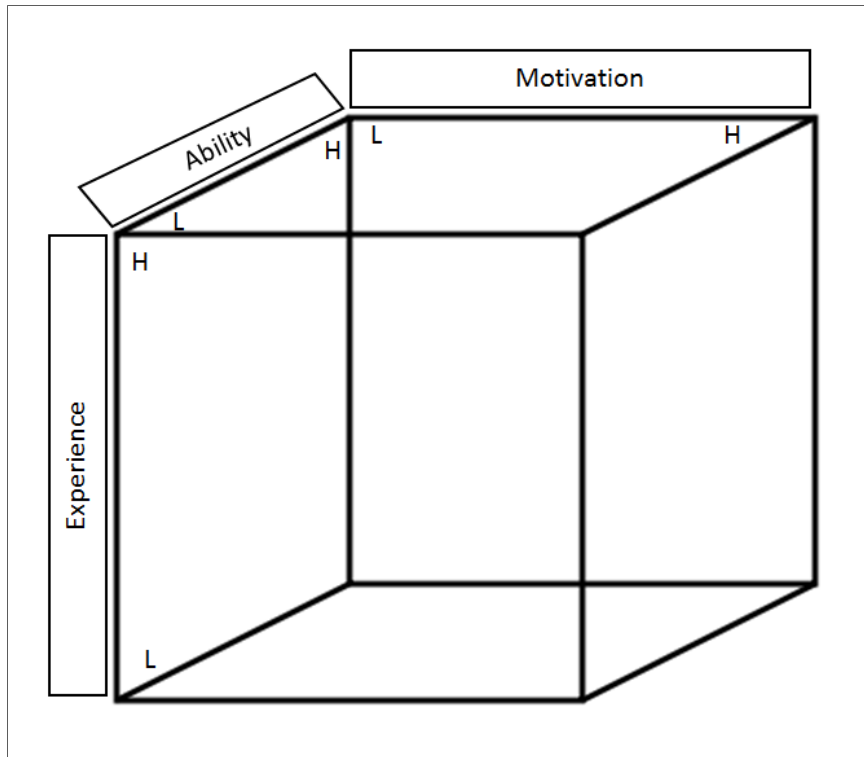
Toward A Model of Older Adult Digital Gaming

When considering an aging gamer's *motivation, experience* and *ability*, a context for senior gaming is created. The strength and influence on propensity for game playing of each of these domains is influenced by numerous variables, as discussed in the previous section, and is subject to fluctuation as the person moves through the life course. This variation may be accounted for by a change in the number of variables influencing that domain and/or a change in the intensity of particular variables. In addition, this propensity to engage in gameplay is shaped by the individual's life history of play.

Figure 5.1 (Model for Senior Digital Gaming) demonstrates how the three domains function in concert to provide a static representation of an aging gamer. This model affords the placement of a digital gamer within a three-dimensional space based on the strength of each domain. Each dimension is labeled by one of the three axes and the strength of each domain is indicated from "L" (low level of strength) through "H" (high

level of strength). By using these measures to represent a gamer's level of motivation, experience, and ability, a static portrayal of the context of their gaming emerges.

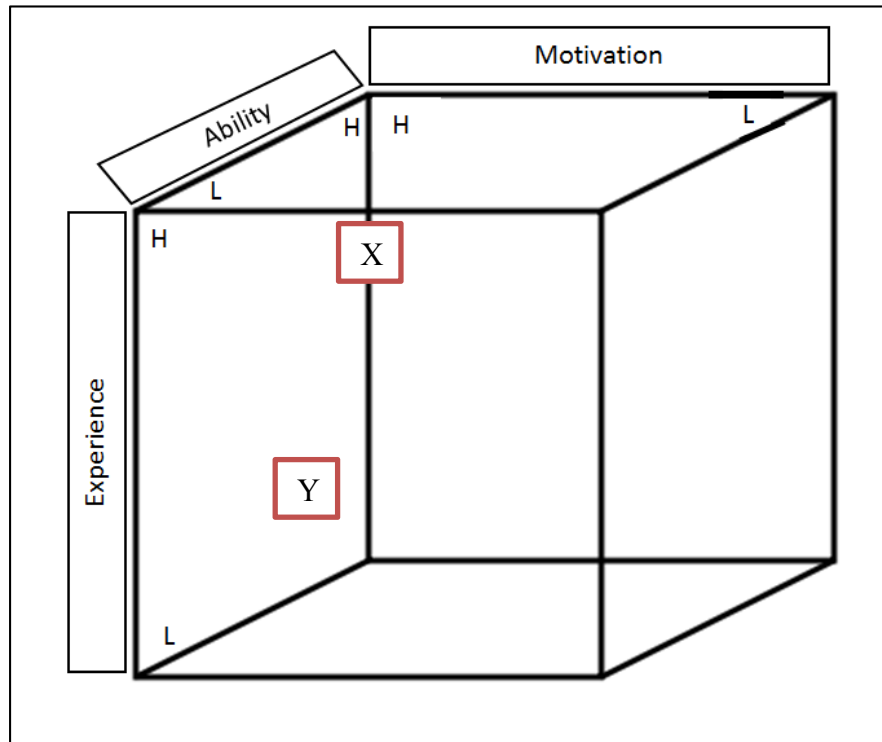
Figure 5.1 – Model for Older Adult Digital Gaming



For example, if a gamer has a high level of experience and motivation to play digital games and has a somewhat high level of functional ability to interact with them, then he or she would be represented within the upper, far back right of the box, as indicated by the 'X' in following Figure 5.2. Mike is a participant who would represent these qualities. He is highly motivated to play digital games and has years of experience, yet is experiencing some minor functional abilities issues that interferes with his gaming.

A gamer with lower level of experience and somewhat low level of ability, but with a high level of motivation, would be positioned within the box as indicated by the 'Y' in Figure 5.2. These qualities are similar to Rebecca when she was immobile. Despite her experience and ability level, she was highly motivated to play.

Figure 5.2 – Model for Older Adult Digital Gaming: Example

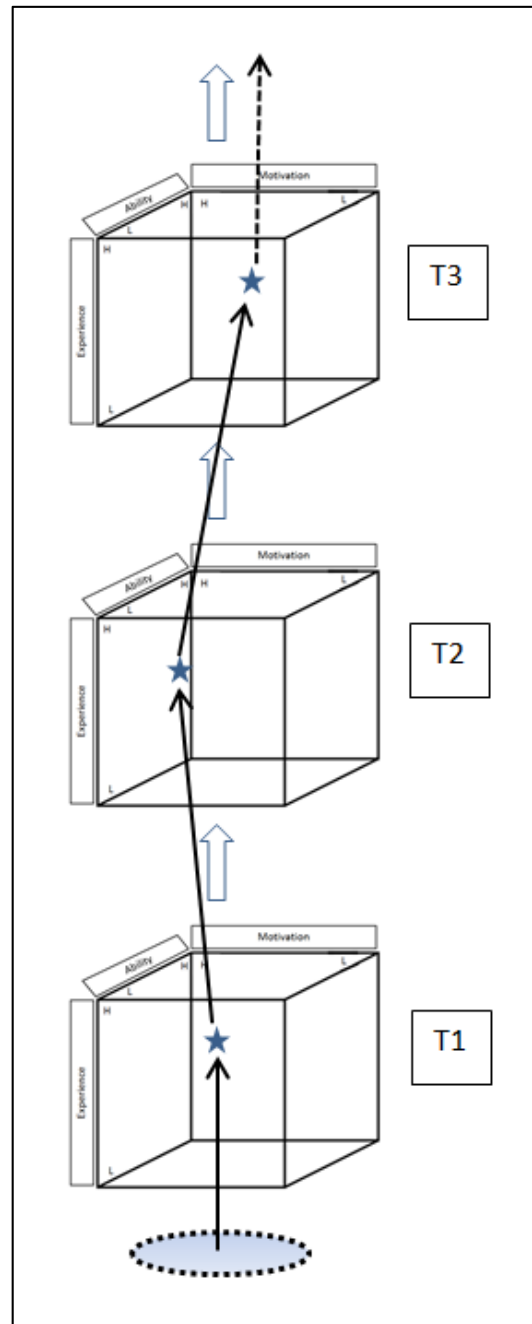


This model is a static representation – a snapshot of a person’s status at a single moment in time. This alone does not give a comprehensive portrayal. The life course perspective employed in this study suggests that a person’s path (or trajectory) within this three dimensional space is shaped by their changing conceptualization of play. The shift of a gamer within this box, this may influence other domains. For example, a gamer with high levels of experience and ability may encounter decreasing levels of ability. This is similar to Mike’s concern with of anticipated decline of visual acuity and reaction time. The shift in ability level may alter his motivations for playing and the strength of those motivations. At one time, such a person may have played primarily for enjoyment, but now, because their play options have become limited due to declining abilities, their motivation for playing may have also altered. In addition, when such a shift occurs, the gamer’s ability to maintain play preferences must be considered as it may prompt the

gamer to seek alternatives. This includes the search for another game and/or platform, or it may result in digital game abandonment.

Figure 5.3 provides a dynamic model that demonstrates how a gamer can be represented at different periods of time. Instead of a single box, three boxes are used within this model to represent points on the life course continuum at three different points in time – ‘T1’, ‘T2’, and ‘T3’. At T1 an aging gamer may have fairly high motivation and moderately high levels of ability and experience with respect to digital gameplay. Such a gamer may have relied upon gaming as a mode of socialization (motivation). Over time, the aging gamer began to experience ability-related challenges, such as a decline in visual acuity and a gradual delay with reaction time. This shift is represented in T2. These ability-related challenges began to affect his/her willingness to play socially, thus affecting the strength of their motivation.

Figure 5.3 – A Life Course Model of Older Adult Gaming



This chapter introduced a conceptual theory of older adult digital game engagement that was grounded in a study of 40 older adult gamers. Engagement in digital gaming in old age is a life course extension of play that is a function of the person's motivation, experience, and ability. Each of the three domains – motivation,

experience, and ability – is influenced by numerous variables and is likely to fluctuate over time. My conceptualization of a model of older adult gaming showcases how an aging gamer can be viewed as situated within a three-dimensional space representing the three domains. The life course representation of this model as it evolves over time captures the notion of change in each of the primary dimensions as it tracks the changing position of the individual in the proposed conceptual space. This final model also depicts how changes in the three dimensions are influenced by, indeed, embraced within the flow of the individual’s changing perception of play over the life course.

The final chapter of this dissertation provides a summary of the findings, acknowledges limitations of the study and explores possible future directions.

CHAPTER SIX: CONCLUSION

This dissertation study used a life course perspective to examine the role and significance of digital gaming in the lives of aging digital game players by employing grounded theory methodology. The specific aims of this study were:

- I.) *To investigate how senior digital gameplay reflects a life course-related extension of the phenomenon of play in old age;*
- II.) *To investigate the role of functional ability in conditioning receptivity toward digital gameplay among senior gamers; and*
- III.) *To develop a theoretical perspective of digital gaming in old age.*

The findings from Specific Aims I and II resulted in a series of themes that contributed to the generation of theory, Specific Aim III. This theory identifies three primary domains (*motivation, experience, and ability*) that influence digital gaming engagement of an individual gamer. A theoretical model was created to demonstrate this theory; the first component of the model is a static representation of the gamer at a particular point in time, and the second component highlights the dynamic nature of the domains by indicating change over time. When assessing these domains from a life course perspective that integrates the individual's notion of play, a more holistic picture is provided. This leads one to consider the variables that contribute to and affect the balance of these domains and how these domains may alter as the gamer ages. Depending upon the perceived value of digital game engagement to the gamer, this shift or barrier to play may affect their quality of life.

Limitations

This study provided insight into the lives of senior gamers; yet several limitations merit discussion, including sampling bias. The majority of the participants were recruited via an approved posted advertisement and the rest were recruited via snowball sampling. These methods can lead to sampling bias. Although current demographic characteristics of the senior gamer market are not available to the public, it is unlikely that the participants within this study fully represent this market segment as a whole. In addition, the participants do not geographically represent the senior market, as most of them reside in or near a large town in Kentucky and six outside of Richmond, Virginia.

The number and age range of the participants also proved to be a limitation. I interviewed 29 older gamers and 11 younger gamers. It would have been beneficial if additional younger gamers were interviewed because this may have resulted in richer insight of how this gaming generation differs from older gamers and how they differ individually among each other with respect to gameplay. Also, the oldest gamer interviewed is 77 years old. Interviewing older adult gamers older than 77 years of age may have provided a greater range of responses with respect to age cohorts. In sum, because of its exploratory nature, although there was considerable overlap and repetitiveness in the comments received from participants as the numbers of persons interviewed increased, it is not clear that saturation of categories was achieved.

Because this study used a life course perspective, participants were asked to share their memories of events throughout their life. This is a limitation as it is subject to recall bias. Participant recollection and interpretation of events may be biased by any number of variables, including social desirability and inaccurate recall.

Implications

Digital Gaming and Quality of Life

It was evident from the findings that play is a necessary component throughout the lifespan and is critical to quality of life, especially in old age. Those participants who expressed having a limited number of options for play with advancing age indicated that digital gaming is a viable play option. Yet, this may become compromised as ability levels decline.

The younger gamers within the study emphasized a stronger association between digital gaming and quality of life, as gaming has been a self-selected lifelong activity for play. By understanding the influence of each the theory's domains over time, we are better able to identify the factors that not only promote, but also hinder gameplay. Identifying these factors is an initial step into exploring how inhibitors within a domain can be addressed. This may include the development of digital games and platforms that meet particular ability-based needs. For example, an aging gamer that is highly motivated and experienced, yet has severe arthritis, may benefit from a platform that is more accommodating to this need. Recognizing and addressing this need allows the gamer to continue with an activity that has value to them. The significance of games may not continue for all aging gamers as they enter into advanced age, but for those who have limited play options or have relied upon digital games as a primary form play for most of their life, it may be invaluable.

Theory generated from this study is also applicable to a range of disciplines, such as rehabilitative gaming and game studies, and can be used to gain insight on the key factors that influence digital game use among aging persons.

Digital Games for Rehabilitation

Digital games have become a source of great interest within the rehabilitation community due to their potential as a tool for older clients to meet therapeutic goals. One of the themes that have emerged from numerous studies (see Chapter Two) is the importance of client motivation. If there was insufficient motivation (Domain #1) to utilize and maintain the digital game, then the rehabilitative goals were at risk. In addition, the participants in these studies exhibited a range of ability levels and demonstrated at least one functional impairment. Limited ability (Domain #3) can be so great that it can prohibit use of digital games as a rehabilitative tool. Nonetheless, investigation of a client's motivation and experience (Domain #2) may prove beneficial so that alternate options can be identified.

With this in mind, it can be argued that digital game-based interventions have the potential to meet rehabilitative goals if appropriate systems are developed by the gaming industry. This provides an opportunity for advancement in game design and the development of digital games that specifically cater to or take into account populations who are experiencing functional limitations. This notion extends beyond aging gamers, as it includes younger persons who currently game play or would like to, but are hindered by ability-related barriers. This merits closer attention to the gap that exists between the gaming industry and those who may benefit.

Digital Game Industry

The theory presented in the previous pages focuses heavily upon the aging gamer, yet equal attention should be drawn to digital gaming technologies. As previously discussed, participants expressed how they believe the gaming industry lacks awareness

of aging considerations, which affects their ability to produce age- and ability-appropriate games. Yet, as lifelong gamers approach old age (including younger gamers), the digital game industry may be forced to recognize and address the need for change not only for usability reasons but also for financial self-interest. Bobby, who regularly follows events and developments in the gaming market, echoed this sentiment: “We’ll get to a point that at some stage a company like EA or Activision is going to realize that there’s money to be made for this age group.” With this in mind, a future older adult gamer may not be as disadvantaged as current older adult gamers if more accommodating digital games are made available.

This raises the question of the extent to which the digital gaming industry is prepared to meet the needs of current and future senior gamers. Since their inception, digital games have been largely designed for and marketed to younger generations. Only in recent years has there been some consideration for the inclusion of aging gamers, as evidenced by the promotion of “brain training” games (Ackerman et al., 2010). Yet, as also evidenced by this study, the majority of older adults do not utilize games that are designed specifically for their physical and cognitive needs.

Only two participants, Ann and Loretta, shared that they have played or currently play a brain training game. Interestingly, both of these older gamers shared that they are not inclined to continue playing due to cost. Loretta stated, “It’s expensive and I probably won’t take it next year because I’m not sure I can justify the cost.” Ann shared a similar sentiment as she commented on the limited appeal of these games. “Well, after you’ve played them for a while, then it’s the same thing over and over just like the ones I’m playing... I’d be angry with myself for paying money for something I wasn’t using.”

This provides further reason to argue that the gaming industry does not fully understand the dynamic characteristics of senior gamers. Yet, as previously discussed, sales will likely be the catalyst for change.

The current gap within the digital gaming industry with respect to old age-appropriate alternatives inhibits the potential for gaming opportunities among current older adult gamers and fails to recognize and, therefore, prepare for the next generation of older adult gamers. To bridge this gap, dialogue between gerontological researchers and the gaming industry is warranted. Yet to be affective, this dialogue must arise from a sturdy theoretical foundation. The theoretical perspective proposed in this study provides an initial hypothesis furnishing foundational underpinnings for such theory to develop.

Further development of the theoretical framework proposed in this dissertation, should it be supported by subsequent research, has the potential to serve future senior gamers by taking into account their unique gaming characteristics. Failure to elaborate or advance theory as a basis for the development of appropriate digital games directly influences the potential quality-of-life of an entire generation of potential senior gamers.

Future Directions

The findings and theory that resulted from this study are a springboard for numerous future studies. Additional qualitative investigations, similar to what has been conducted here will explore select age cohorts – in particular, the younger gamers (age 40 to 59) who commit a larger amount of time to gameplay. These persons are the next generation of senior gamers and this study suggests that they may have different motivations and a greater level of experience, as well as different game preferences, in comparison with today's older gamers. In addition, efforts are already in place to

continue this study among older gamers who are experiencing higher levels of health decline. It is anticipated that this will provide richer insight into motivational factors as well as health-related barriers to the utilization of digital games by older adults.

Such studies may lead to the development of a tool that quantitatively measures each individual domain and then assess relationships among the domains and the temporal trajectory of the evolution of such domains for individual older adults. In turn these measurements may be plotted into the model for cluster analysis purposes. Identified clusters may indicate potential gamer typologies. This may also lend insight into how a domain may be strengthened, such as developing games that are more accommodating to particular ability-related weaknesses. For example, a quantitative assessment may place a gamer within a particular quadrant of the model. Yet if barriers can be identified and addressed, this may influence a shift in position within the model. Furthermore, this may also influence domains such as a change with respect to motivational factors. To aid this effort, there is a need for further more in-depth research on the motivation domain in relation to digital game interaction.

Further investigation is also warranted of themes that emerged beyond the scope of the specific aims; these include the use of digital games as a means to maintain or nurture social relationships. The findings suggest that digital games may serve as a communication tool; further exploration may reveal the ways in which social relationships are benefited by engagement in this activity.

Reflection

Shortly after I began volunteering at an assisted living facility seven years ago, the activities director commented to me, “Be careful, you’ll end up loving this and doing

this someday.” I laughed at the notion. I was unaware at that time that the residents would soon be introduced to the Nintendo Wii console and how my involvement with this activity would prove to be a life course event that altered the trajectory of my own life.

Although I recall expressions of joy from the residents who played, I never forgot the frustrations they encountered when trying to manipulate various aspects of the game. I, too, was frustrated that the technology seemed difficult to manipulate at times, yet I was also hopeful as I saw how they benefited from this activity. I saw that digital games had the potential for being a valuable form of play in old age. This is the experience and driving force that ultimately resulted in this dissertation study and it is my hope that it, and future studies, translate into real world applications. I hope that my dissertation and forthcoming studies ultimately affect the quality of life for future generations of aging gamers, as play is for *all ages*.

Appendix 1: Recruitment Script

When corresponding with a potential participant, I used the following script.

Hello (Name) ,

My name is Julie Brown and I am a student at the Graduate Center for Gerontology at the University of Kentucky.

I was speaking to (Name) recently and he/she suggested that I contact you because you may be interested in learning about a study I am doing and that you may be willing to be a participant in the study.

I am performing a study that looks at the role and meaning of play in the lives of adults who play digital games. Digital games are also known as video games and are often recognized by names like the Nintendo Wii, Sony PlayStation, and Microsoft XBOX. However, digital games are also games played on the computer or cell phone. If you are interested in hearing more, I would be happy to share more information with you at this time.

(If the individual is not interested, I will thank them for their time, provide my name and contact information if he/she would like it, and hang up. If they are interested in learning more, I will continue with the script.)

My study is titled, “Let’s Play: Understanding the Role and Meaning of Play in the Lives of Senior Gamers” and involves one-on-one interviews with persons that qualify for the study.

I am interested in learning more about a person’s self-perception of play over their life course and how that may influence them with playing digital games. Specifically, I am interested in persons over the age of 60 who play digital games at least one hour a week. If you are interested in participating in this study or at least interested in learning more about it, would you mind if I asked you a few questions to see if you may qualify?

(If I get the sense that the individual is still interested in learning more, I will continue with the following.)

Are you at least 60 years old? I ask this because all participants in this study must be age 60 or above.

Finally, I need to verify whether or not you believe you are of at least fair health to participate. If you feel comfortable enough to respond to this question, please do so.

In general, would you say your health is excellent, very good, good, fair, or poor?

(I will circle the number that corresponds to their response.)

Excellent	1
Very good	2
Good	3
Fair	4
Poor	5

(If the individual responds “no” to any of the above questions and/or provides a self-perceived health status of “poor”, I would politely tell him/her that based on a response of “no”, he/she is ineligible. I would then answer any questions he or she may have and if appropriate, ask if they may know of any friends that may be interested in the study. I will relay to them that I am specifically looking for persons age 60 and over that also play video games. I will provide my name and contact information so that they may pass it along if they care to share it or desire to contact me at any time. If they are willing to provide an individual’s name and contact information, I will clearly request permission to use their name as a reference.

If the individual responds “yes” to all of the questions, I will then proceed with the following.)

Thank you for taking the time to answer, Mr./Mrs. _____. I am pleased to say that at this time, you appear to be eligible to participate.

If you are interested in learning more detailed information about the study and how you could be a participant, I would be happy to meet you at a time and location convenient for you; for example, a coffee shop, library, or your home. During that time, I would provide you with additional information regarding the reason why I am doing the study, the process of the interview I would have with you, how long you could expect the interview to be, and the kind of questions that would be asked.

Also, if you are to be a participant, you will be asked to sign a few forms that are in place to protect your rights as a participant. I will thoroughly go over these forms and encourage you to ask any question you may have. I will also explain that your participation in this study would be voluntary and you can withdraw at any time without penalty. Additionally, there is no payment for your participation.

I anticipate that it would only take about 30 minutes to go over this information, but I am willing to take as long as needed to make sure that all of your questions are answered and that you feel comfortable with the process.

(At this time we will mutually agree upon a location and time to meet. Also, I will answer any remaining questions that he or she has and provide my contact information.)

Finally, please know that the personal information you provided in this phone call will not be shared with unauthorized persons, including the individual that recommended I contact you.

Please feel free to contact me at any time before this date, Mr./Mrs._____. In addition, I am happy to provide you with a reminder call if you'd like.

(Confirm reminder call- this includes phone number to call and when to call.)

Thank you so much for your time and I truly look forward to meeting you.

Goodbye!

(When we meet at the designated location, I will verify that the potential participant is eligible per the criterion in Form B and if appropriate, ask if they know of anybody that may be interested in learning more about the study. Confidentiality will be emphasized.)

**Appendix 2:
Consent to Participate in a Research Study**

**Let's Play: Understanding the Role and Meaning of Play
in the Lives of Senior Digital Gamers**

WHY ARE YOU BEING INVITED TO TAKE PART IN THIS RESEARCH?

You are being invited to take part in a research study about the role and meaning of play among older persons who play digital games. Digital games are also referred to as video, computer, or cell phone games. Older adults who play such digital games are referred to as “senior gamers”. You are being invited to take part in this research study because you identified yourself as an individual over the age of 60 who plays digital games at least one hour per week. If you volunteer to take part in this study, you will be one of about 50 people to do so.

WHO IS DOING THE STUDY?

The person in charge of this study is (*Principal Investigator, PI*) Julie A. Brown, a doctoral candidate within the Graduate School of Gerontology of University of Kentucky. She is being guided in this research by her academic advisor, Dr. Graham D. Rowles. There may be other people on the research team assisting at different times during the study.

WHAT IS THE PURPOSE OF THIS STUDY?

By doing this study, we hope to learn how play over the course of a senior gamer’s life influences his or her personal digital games experiences.

The objectives of this study are to:

- A) Develop a theoretical model for understanding the meaning and role of play among senior gamers
- B) Decipher self-reported perceptions of and participation in play throughout the life course.
- C) Assess levels of self-reported functional ability and receptivity toward play.
- D) Interpret and translate findings into potential design implications for digital games.

ARE THERE REASONS WHY YOU SHOULD NOT TAKE PART IN THIS STUDY?

Your participation will be respectfully declined if you are 1) under the age of 60, 2) play less than one hour of digital games a week, and 3) are unable to provide informed consent. If you would prefer to not participate in this study, you may decline the opportunity to do so.

WHERE IS THE STUDY GOING TO TAKE PLACE AND HOW LONG WILL IT LAST?

The research procedures will be conducted at a location agreed upon by you (the participant) and the P.I. You will need to be present at this location to participate in the study. It is possible that the interview may be only one session in length, yet an

additional session or two may be necessary to provide you ample time to elaborate upon responses if you would like and agree to do so. Also, one of these sessions may include a time that the P.I. shares your interview responses with you, so that you might have an opportunity to verify its accuracy or provide additional feedback. The total amount of time you will be asked to volunteer for this study is expected to be less than three hours over the course of the next month, but may be more, dependent upon how much information you would like to share.

WHAT WILL YOU BE ASKED TO DO?

You will be asked to answer a series of questions based on your perception of the meaning and role of “play” over the course of your life and how this has influenced you with playing digital games. You are free to answer a question in as much detail as you would like, or, you may choose to not answer a question.

The interview will be digitally recorded so that I may later transcribe the interview for analysis purposes. Your name will not be recorded within the transcript.

Because it is possible that the interview may take more than one session or you may want to contact me to share additional details about any of your responses, it may be helpful to make arrangements for that as soon as possible within a month’s time.

WHAT ARE THE POSSIBLE RISKS AND DISCOMFORTS?

To the best of our knowledge, the things you will be doing have no more risk of harm than you would experience in everyday life.

WILL YOU BENEFIT FROM TAKING PART IN THIS STUDY?

There is no guarantee that you will get any benefit from taking part in this study. However, some people have experienced satisfaction knowing they have participated in a new area of research based on their experience with digital games. Your willingness to take part may help society as a whole better understand this research topic.

DO YOU HAVE TO TAKE PART IN THE STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any benefits or rights you would normally have if you choose not to volunteer. You can stop at any time during the study and still keep the benefits and rights you had before volunteering.

IF YOU DON’T WANT TO TAKE PART IN THE STUDY, ARE THERE OTHER CHOICES?

If you do not want to be in the study, there are no other choices except not to take part in the study.

WHAT WILL IT COST YOU TO PARTICIPATE?

There are no costs associated with taking part in the study.

WILL YOU RECEIVE ANY REWARDS FOR TAKING PART IN THIS STUDY?

You will not receive any rewards or payment for taking part in the study.

WHO WILL SEE THE INFORMATION THAT YOU GIVE?

We will make every effort to keep private all research records that identify you to the extent allowed by law.

Your information will be assessed both individually and as part of a group that includes the other participants that take part in this study. When we write about the study to share it with other researchers, we will write about these assessments and you will not be personally identified in these written materials. We may publish the results of this study; however, we will keep your name and other identifying information private.

We will make every effort to prevent anyone who is not on the research team from knowing that you gave us information, or what that information is. *All* collected data will be kept in a locked, secure location. Only the research team will have access to this information.

We will keep private all research records that identify you to the extent allowed by law. However, there are some circumstances in which we may have to show your information to other people. We may be required to show information which identifies you to people who need to be sure we have done the research correctly; these would be people from such organizations as the University of Kentucky.

CAN YOUR TAKING PART IN THE STUDY END EARLY?

If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. You will not be treated differently if you decide to stop taking part in the study.

The individuals conducting the study may need to withdraw you from the study. This may occur if you are not able to follow the directions they give you or if they find that your being in the study is more risk than benefit to you.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS, CONCERNS, OR COMPLAINTS?

Before you decide whether to accept this invitation to take part in the study, please ask any questions that might come to mind now. Later, if you have questions, suggestions, concerns, or complaints about the study, you can contact the investigator, Julie A. Brown at (804) 691-9979. If you have any questions about your rights as a volunteer in this research, contact the staff in the Office of Research Integrity at the University of Kentucky at 859-257-9428 or toll free at 1-866-400-9428. We will give you a signed copy of this consent form to take with you.

WHAT ELSE DO YOU NEED TO KNOW?

I have read the foregoing information. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent

voluntarily to participate as a participant in this research and understand that I have the right to withdraw at any time. I have caused this consent to be executed on the date indicated below, and I understand that I will be given a copy of this consent form after I have signed it.

Signature of person agreeing to take part in the study

Date

Printed name of person agreeing to take part in the study

Name of [authorized] person obtaining informed consent

Date

Appendix 3:
Approved Advertisement for Participants age 60 and Above

Do You Play Electronic Games?

In recent years, electronic versions of games have become popular among aging adults. These electronic games are typically played on the computer, a cell phone, or home video game system and the games may be puzzles, a card game, trivia, or a game that is sports-related. In addition, it has been found that playing electronic games may help an aging person to maintain cognitive and physical function. Unfortunately, there are very few studies that specifically research older persons who play these kinds of games.

I am a doctoral candidate at the University of Kentucky's Graduate Center for Gerontology and I am seeking volunteers to interview as part of my dissertation. From these interviews, I would like to learn how persons have engaged in forms of play throughout their life and how this relates to why they currently play electronic versions of games.

Persons interested in participating in this study must be age 60 or above and play some kind of electronic game for at least a total of one hour per week. (*Examples of these games include Solitaire on the computer, Wii Bowling, or games played on Facebook.*) This is a new academic area of study and the information gained from this research can provide valuable insight into the preferences and needs of older game players, which can aid in the development of games that are better suited for aging populations.

If you are interested in participating and would like to learn more, please send an email to julie.a.brown@uky.edu or call (859) 218-0194. Any information you provide will be kept completely confidential.

Julie A. Brown
Doctoral Candidate
Graduate Center for Gerontology
University of Kentucky

Appendix 4:
Approved Advertisement for Participants age 40 and Above

Do You Play Digital Games?

In recent years, electronic versions of games (digital games) have become popular among the adult population. Digital games are typically played on the computer, cell phone, or home video game system, and the games may be puzzles, card games, trivia, or a game that is action/adventure-related. In addition, it has been found that playing digital games may help a person to maintain cognitive and physical function. Unfortunately, there are very few studies that specifically research adults who play digital games.

I am a doctoral candidate at the University of Kentucky's Graduate Center for Gerontology and I am seeking volunteers to interview as part of my dissertation. From these interviews, I would like to learn how persons have engaged in forms of play throughout their life and how this relates to why they currently play digital games.

Persons interested in participating in this study must be age 40 or above *and* play a minimum of one hour of digital games per week. (Examples of these games include Solitaire on the computer, XBOX or Nintendo games, or games played on Facebook.) This is a new academic area of study and the information gained from this research can provide valuable insight into the preferences and needs of adult game players, which can aid in the development of games that are better suited for this population.

If you are interested in participating and would like to learn more, please send an email to **julie.a.brown@uky.edu** or call **(859) 218-0194**. Any information you provide will be kept completely confidential.

Julie A. Brown
Doctoral Candidate
Graduate Center for Gerontology
University of Kentucky

Appendix 5: Interview Guide

Rapport Establishment

Please tell me a little about yourself and your life

- 1) Where were you born?
- 2) Where did you grow up? School?
- 3) If you were employed, what kind of work did you do?
- 4) What kind of family life have you had?
- 5) What were some of your happiest times?
- 6) Were there any particularly hard times? Tell me about them

Play

1. I'd like to begin by getting a sense of what play means to you
 - a) How would you define "play"? (key words)

Play in Childhood

1. How did you engage in play as a child?
 - a) What did you enjoy most about (activity)?
 - b) Was there a time when you stopped playing (activity)? Why?
2. How did these play activities benefit you?
3. Do you still engage in any of those activities?
 - a) If yes, which ones and why?
 - b) If not, why not?

Play in Young Adulthood

1. How did you engage in play as a young adult?
 - a) What did you enjoy most about (activity)?
 - b) Was there a time when you stopped playing (activity)? Why?
2. How did these play activities benefit you?
3. Do you still engage in any of those activities?
 - a) If yes, which ones and why?
 - b) If not, why not?

Play in Middle Adulthood

1. How did you engage in play as a middle-aged adult?
 - a) What did you enjoy most about (activity)?
 - b) Was there a time when you stopped playing (activity)? Why?
2. How did these play activities benefit you?
3. Do you still engage in any of those activities?
 - a) If yes, which ones and why?

b) If not, why not?

Play in Old Age

1. How do you currently engage in play?
 - a) What do you enjoy most about (activity)?
 - b) Have there been barriers to playing (activity)? How so and how might have they been overcome?
2. How does playing benefit you?
 - a) How does it affect you if you are unable to play?
 - b) Are there ways in that you'd like to play now but do not? Tell me about this.
4. How has your view of the meaning of play changed over the course of your life?
 - a) What do you think has influenced that change?
 - b) Has the importance of play in your life changed as you've aged? Tell me about this.

Now let's turn our attention to one type of gaming that has become increasingly popular—digital games.

Digital Games

1. How did you get started in playing digital games?

Let's talk about this

 - a) What digital games do you play?
 - b) Which ones do you enjoy most?
 - c) How often do you play digital games?
 - d) When you play digital games, how long do you play for in a single session?
2. How, if at all, has playing videogames changed your life?
 - a) Physically?
 - b) Socially? (For example, relationships with peers/children/grandchildren, reduction of loneliness/something to do?)
 - c) Mentally/Cognitively? (For example, keeping an active mind, improving well-being)
3. Are there digital games that you would like to play but have not?
 - a) Why? What prevented you from playing these games?
 - b) How did that affect you?
 - c) What kinds of barriers do you see that prevent older adults from playing digital games?
4. Do you think this has improved your quality of life? In what ways?
5. What do you see as the benefits for older adults of playing digital games?
 - a) (If any are reported)- Do you experience these benefits?
6. What drawbacks, if any, do you see with respect to the increasing use of digital gaming by older adults?
 - a) Have you personally noticed or experienced any of these drawbacks?
7. How typical do you think your gaming experiences are of other senior gamers your age?

Closure Question

1. Do you have additional thoughts or ideas about video gaming or any of the topics we have been discussing that you would like to share?

Demographic/Background Information

Participant Age: _____

Sex: Male or Female

Number of hours per month that participant plays digital games: _____

Approximately when participant began playing digital games: _____

Platform(s) for digital game use (computer, cell phone, console): _____

Digital game(s) most played: _____

Thank you for your help!

If we needed to talk again, would this be OK with you? **Yes or No**

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Vitae

Education

- Ph.D. 2009 – 2014, University of Kentucky (Gerontology), Advanced to Candidacy
April 2012, Dissertation Title: *Understanding the Role and Meaning of Digital Games in Old Age*
- Human-Technology Interaction Graduate Certificate, 2013, University of Kentucky
- M.S. 2002, Longwood University, Farmville, Vivian (Community & College
Counseling and Guidance & Counseling - Secondary Level)
- B.A. 1999, Longwood University, Farmville, Vivian (Psychology – Clinical and Social)

Professional Appointments

- 2013 – 2014, Graduate Instructor for the Graduate Center for Gerontology, College of Public Health, University of Kentucky: GRN 250-*Aging in Today's World*
- 2012 – 2013, Graduate Teaching Assistant for Dr. Graham D. Rowles, Fall 2012, GRN 250, and Dr. John F. Watkins, Spring 2013, GRN 250
- 2011 – 2014, Geriatric Consultant and Caregiving Trainer, Comfort Keepers, Inc., Lexington, Kentucky
- 2010 – 2012, Gerontology Researcher, Commonwealth of Kentucky- Department of Aging and Independent Living and Commonwealth of Kentucky Institute on Aging
- 2009 – present, Research Assistant for Dr. Graham D. Rowles
- 2002 – 2009, Guidance Counselor, Prince George High School, Prince George, Vivian
- 2001 – 2002, Guidance Counselor, Middlesex High School, Middlesex, Vivian

Publications

- Brown, J.A.**, McIlwain, A., & Rowles, G.D. (In press). Environmental design and assistive technologies. In G.D. Rowles & P.B. Teaster (Eds.), *Long-Term Care in an Aging Society*. Clifton Park, NY: Delmar/Cengage Learning.
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