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# Variations In Video Game Play Habits And Beliefs Over Time

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# VARIATIONS IN VIDEO GAME PLAY HABITS AND BELIEFS OVER TIME

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This dissertation, submitted by John Adam Campbell in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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John Adam Campbell
May 1, 2017

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ABSTRACT

Psychological research about the consequences of playing video games has grown exponentially, correlating to the exponential growth of the video game industry. In the past decade, a major impetus has related to the concept of video game addiction, pathological gaming, or Internet Gaming Disorder. While the presence of this problem is widely accepted and there is growing knowledge about the factors contributing to its development and perpetuation, there is minimal research speaking to intervention. The primary purpose of the present study was to identify a potential pathway to educate members of the gaming community about pathological gaming, with the hope that some of these educated members would recognize their own struggles and seek help. Secondary to that purpose was the intention of identifying factors correlating with awareness of pathological gaming problems and influencing help-seeking behavior among pathological gamers. To pursue these goals, an online survey was made available to avid gamers (*N*=881) through reddit.com. The survey contained questions about demographic factors, video game play habits and history, pathological gaming, and mental health factors (anxiety, depression, stress, ADHD). Participants completed the survey, then were exposed to a three minute intervention period (wait period, neutral support group, pathological gaming support group, diagnostic awareness lecture) before being asked to again complete the pathological gaming questionnaire. Participants were invited to a one-month follow up to assess changes in pathological gaming awareness and any efforts to engage in help-seeking behavior. Results did not find significant main effects across intervention conditions for awareness of pathological gaming or pursuit of help-seeking behavior. However, nearly 20% of those

participating in the one month follow up reported engaging in some form of help-seeking behavior. Tendencies to engage in help seeking behavior were best predicted by self-reported level of pathological gaming and inattentiveness. Thus, there is considerable benefit to increase awareness of pathological gaming and it is important to recognize that ADHD may be a critically impactful factor for increasing the risk of developing pathological gaming.

# CHAPTER I

# INTRODUCTION

## Video Games in Society

In the half century since the invention of video games, there has been an exponential growth in terms of capability, dissemination, and consumption, on a scale similar to that of the automobile, the personal computer, and the cell phone, rapidly saturating global society (Eigenfeldt-Nielsen, Smith, & Tosca, 2016; Wolf & Baer, 2002). A simple, but profound, example of the enormity of gaming lies in the fact that a single game (*Grand Theft Auto V*) had over one *billion* dollars in sales worldwide within *three days* of its release, which can be associated with an additional pre-existing investment of between four and eight billion dollars in consoles and controllers to play the game (Peckham, 2013). As video gaming has become increasingly popular, growing attention has been invested in the various, potentially negative consequences of video game play (Kim et al., 2016; Kowert, Vogelgesang, Festl, & Quandt, 2015). Among the various negative consequences explored, there is growing research regarding the concept of video game addiction which is being considered as a condition for further study in the DSM-5 under the name of Internet Gaming Disorder (American Psychiatric Association [APA], 2013) although terms such as gaming pathology or pathological gaming have also been used (Campbell, 2012).

Before delving into problems related to gaming, it is worthwhile to first discuss the extremely heterogeneous concept of video games and the experience of playing video games. The concept of video games is as diverse as the concept of games themselves, and can

encompass almost any activity in almost any setting and is in some regards considered to be a qualitatively new form of play (Salonius-Pasternak & Gelfond, 2005). The most critical universal component of a "video game" per se, is the incorporation of an electronic device which allows for interaction with the gamer(s) (Eigenfeldt-Nielsen, Smith, & Tosca, 2016; Wolf & Baer, 2002). The actual electronic device, type of interaction, and content of gaming has only been limited by technological capabilities and the human imagination, and both of these limits are challenged on a daily basis.

The medium for video game play can include a range of options with the most commonly used media including a television set with a connected video game console (i.e. Playstation 3), a handheld video game console (i.e. Nintendo DS), a cellular phone, a personal computer, or a combined audio-visual gaming device (i.e. arcade machines) (Eigenfeldt-Nielsen, Smith, & Tosca, 2016). Playing may occur as a solitary activity, in which the gamer interacts with an artificial intelligence (gaming software) or as a social activity, in which case the gamer may interact with others in direct physical proximity (i.e. LAN party) or distant proximity connected via internet (Ducheneat, Yee, Nickell & Moore, 2006). The means of interaction also varies considerably with interface devices including touch-screens, keyboards, "controllers" (i.e. joystick), infrared and motion sensitive devices (i.e. Wii controller), and life-like interactive devices (i.e. guitar controller) (2016).

The content of game play tends to have even greater variety than the hardware used but is generally designed with recreational pursuits in mind; however, games have also been designed for educational, informative, and even therapeutic purposes (Eigenfeldt-Nielsen, Smith & Tosca, 2016; Loguidice & Barton, 2009). Video game content is often classified by genre with four broad, frequently overlapping, categories being widely utilized: Action, Adventure, Strategy, and

Process-Oriented (2016). Action games focus on frequent stimulation and feedback often involving simulated fighting/violence, exploration, or sports. Adventure games revolve around exploration and immersion in a fantasy world with a complex story line; this often overlaps with action game content. Strategy games involve discrete actions and turns involving planning and organization (comparable in principle to chess) based on understanding of the variables of play, typically occurring in a competitive fashion with other players and/or against an artificial intelligence. Process-oriented games are more focused on the journey through a game than on the game story or destination; simulation games are a common example. It should also be noted that games are becoming increasingly dynamic and random, such that no two gaming experiences are completely identical. Another critical component to this dynamic quality is increasing difficulty to match increasing gaming proficiency. In essence, the variety of gaming interactions and gaming content allow for simulation of almost any activity that could occur in real life as well as many activities that would be impossible with a reduced investment of resources and minimized risk of negative consequences (as compared to equivalent real-world activities, such as combat or extreme sports) (Wood, Griffiths, Chappell, & Davies, 2004).

A variety of polls and surveys have found that the vast majority of American children, adolescents, and adults play video games at some point during their lives and a large portion of individuals play video games casually or recreationally (Gentile, 2009; Rideout, Foehr & Roberts, 2010; Segev et al., 2015). There is great variability in how much time and energy gamers invest in playing video games as a function of age, education, and accessibility. There also appears to be some variability in terms of gender and gaming habits, with males spending considerably more time playing video games and investing more energy and resources in gaming activities, especially as a social activity (De Grove, Courtois & Van Looy, 2015). Males are

more likely to identify as “hardcore gamers” and even compared to females identifying as “hardcore gamers” males are often more personally invested in their gaming (Kapalo, Dewar, Rupp & Szalma, 2015). This likely reflects differences in targeted audiences of video games, which have traditionally been directed more towards males than females; as the content and targeting approaches of gaming have diversified, growing numbers of females have become avid gamers as well. Personality factors are also highly varied among gamers, and while many have a stereotype of gamers being neurotic and introverted, it turns out that personality traits such as neuroticism, extraversion, and openness vary considerably across gamers, especially when considering different demographic factors (Braun, Stopfer, Muller, Beutel & Egloff, 2016). For instance, openness was positively correlated with gaming patterns for women and negatively correlated with gaming patterns for men.

While there is great variability in the content of gaming and the audience of gamers, there tend to be great commonalities in the reasons for gaming (Greenberg, et. al. 2008; Kim et al., 2016). While entertainment is the most commonly reported reason for gaming, many gamers use games to alleviate boredom and escape the stresses of their lives (Hellstrom, Nillson, Lepper & Aslund, 2015; Olson et. al. 2007). Thus it has been argued that the most common reasons for gaming among the general population include enjoyment, excitement, and relaxation while achievement, socialization, and immersion are other important reasons for gaming (Kim et al., 2016; Williams, Yee & Caplan, 2008).

Other researchers have focused on the experience of gaming rather than game content or reasons for gaming and have identified the concept of flow as being of critical importance in understanding the pull video games have over gamers, regardless of game content or gamer characteristics (Charlton & Danforth, 2007; Faiola & Vioskounsky, 2007; Kaye, 2016). Previous

research by this author (Campbell, 2012) identified flow, as defined by the Game Engagement Questionnaire, as the strongest predictor of gaming habits and patterns, independently accounting for as much as 25% of the variance in gamers' playing habits. Thus, a more thorough understanding of the concept of flow (Csikszentmihalyi, 2008) is crucial to understanding what it is to play and become engaged in a video game in a way that cuts across game and gamer heterogeneity.

## The Psychology of Flow as it Relates to Video Game Play

The study of "flow" or "optimal experience" (also referred to interchangeably as engagement) was pioneered by Csikszentmihalyi (2008) using a "phenomenological model of consciousness based on information theory" (p. 25) assuming that the definition of consciousness is "intentionally ordered information" (p.26). Flow is most simply defined as "the state in which people are so involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it, even at great cost, for the sheer sake of doing it" (2008; p.4). In other words, flow occurs when an individual is engaged in an activity that requires maximal utilization of cognitive resources and is experienced as enjoyable. Csikszentmihalyi also explained that flow is a ubiquitous phenomenon, occurring across age, gender, cultures, and history in a variety of activities including work, sports, and play. Furthermore, flow may be broken down into eight components, describing both the conditions necessary for flow as well as the phenomenological experiences that are associated with flow. Typically all of these components are experienced simultaneously although it is also possible for flow to be achieved without all of these components present.

A critical component of flow involves the balance of ability and challenge such that one must constantly put forward a full effort while making progress; in other words, the challenge

presented should match the abilities of the player (Csikszentmihalyi, 2008; pp. 48-53). An inequality between challenge and ability can result in boredom (too easy) or anxiety (too difficult) and disrupt the experience of flow, often detracting from enjoyment with the activity. This is often thought of in terms of competition; if one competes against opponents closely matched in terms of ability (be they human or artificial intelligence) they are more likely to become immersed in the activity. This is highly relevant to gaming in various ways and especially in the context of online gaming, which provides unlimited opportunities to challenge oneself against other gamers, with one's sense of self-esteem often being strongly impacted by the outcomes of online gaming competition (Kazakova, Cauberghe, Pandelaere & De Pelsmacker, 2014). From the direct manipulation of the video game interface (which requires practice and coordination) to progressing across increasingly difficult tasks, the game is designed to continually challenge players, regardless of skill level (Eigenfeldt-Nielsen, Smith & Tosca, 2016; Wolf, 2001). Essentially, gamers are constantly facing new challenges in the form of the actual game content, and more recently, in the form of increasing human competition in online gaming (Hussain & Griffiths, 2009; Meredith, Hussain & Griffiths, 2009). Interestingly, it seems that gamers who play for the purpose of achievement more so than fun are at elevated risk of developing excessive gaming habits and problems (Hellstrom et al., 2015).

The second component of flow is that the activity involves the "merging of action and awareness" (Csikszentmihalyi, 2008; pp. 53-54). In essence the activity must utilize all of an individual's attentional resources and conscious awareness, which may account for the sensation of being "in the zone" or "flowing" with minimal effort. In spite of the sense of effortlessness, the activity may be extremely demanding so any lapse in concentration can disrupt this experience. Video games naturally require full allocation of attentional resources due to the

rapid processing of visual, auditory, and tactile information typically involved in playing the game (Dye, Green & Bavalier, 2009). Furthermore, many gamers report that they become so immersed in the game that they lose awareness of their surroundings as all attention is devoted to the task at hand (Faiola & Vioskounsky, 2007). The amount of mental processing involved in gaming is so intense, that long-term gaming habits can increase functional connectivity in the brain between multiple regions associated with visual and auditory processing and motor coordination (Han, Kim, Bae, Renshaw & Anderson, 2015).

The third and fourth components of flow relate to the involvement of clear goals and immediate feedback, respectively; in other words, the activity must have a mission and information as to how well this mission is being achieved (Csikszentmihalyi, 2008; pp. 54-58). This is often the case in sports where specific rules are established and progress is tracked by a running score so that there is impetus for the specific behaviors from moment to moment and for the overall direction of activity. On the other hand, this may also be internally determined, with the person engaging in the activity creating their own goals and monitoring their own progress. This also directly relates to gaming as the gaming interface requires constant interaction and provides on-going, instantaneous feedback as to the player's performance (Eigenfeldt-Nielsen, Smith & Tosca, 2016). This results in a feedback loop which helps guide the gamer in their interactions with the game and requires constant and rapid processing. Furthermore, research from self-determination theory has demonstrated that feedback resulting in need satisfaction increases intrinsic motivation and game play; interestingly, short-term need frustration, combined with an overall sense of success or competence increases both short-term and long-term gaming behaviors (Burgers, Eden, Engelenburg & Burningh, 2015).

The fifth component of flow or optimal experience involves complete and unwavering "concentration on the task at hand" (Csikszentmihalyi, 2008; pp. 58-59). As a consequence of this concentration, individuals in flow rarely contemplate information that is not directly relevant to the activity at hand, which decreases the frequency and intensity of negative thoughts or anything that is not temporally relevant. Again, video games are well suited to this component as they are designed to require maximal attentional resources if the gamer is to be successful and as a result many gamers become completely engrossed in the activity (Adachi & Willoughby, 2012; Eigenfeldt-Nielsen, Smith & Tosca, 2016). In extension of this, many gamers report video games providing a means of escaping from the stresses of their daily lives and describe experiencing a decrease in negative cognitions and emotions while gaming (Faiola & Vioskounsky, 2007; Kim et al., 2016).

The sixth component of flow or optimal experience is referred to as the "paradox of control" (Csikszentmihalyi, 2008; pp. 59-62). This refers to the subjective experience of control that one experiences in this state; this sense of control can occur even in the face of unpredictable or dangerous activities, which results in deemphasizing the amount of danger or potential negative consequences involved in the activity. More importantly, Csikszentmihalyi explains that "what people enjoy is not the sense of *being* in control, but the sense of *exercising* control" during flow (p. 61, 2008). Furthermore, this component is strongly linked to the addictive nature of flow inducing experiences; both flow and addiction include a detachment from the realization that the individual is not actually in control. An inherent component of many gaming designs is the illusion of control; while many gamers have many options and their interactions create the sense of control, these options are still limited by the constraints of the game programming (Eigenfeldt-Nielsen, Tosca, & Smith, 2016; Wolf, 2001). Nonetheless, this illusion of control is

often a strong motivating factor for many gamers, especially if it promotes self-worth (Beard & Wickham, 2016) and this may also contribute to initiative that promotes on-going investment in the games of interest (Adachi & Willoughby, 2012).

The seventh component of flow is that, during such experiences, one loses a sense of self-consciousness (Csikszentmihalyi, 2008; pp. 62-66). This really reflects a sense of being one with the environment, especially those aspects connected to the flow inducing activity; however, this connectedness also implies expansion of the concept of self to allow for integration of the elements of the flow inducing environment, at least temporarily. These experiences can even result in a degree of immersion while gaming such that gamers may lose track of their own sense of self-identity (Beard & Wickham, 2016; King, Delfabbro, & Griffiths, 2009). Another aspect of gaming that directly connects to this concept is the freedom to create avatars which have become increasingly nuanced and realistic (Meredith, Hussain & Griffiths, 2009). Some avid gamers even consider their identity to be intimately connected with their avatars in the game (Faiola & Vioskounsky, 2007) and while there is no general gamer profile, many individuals identify as gamers (De Grove, Courtois & Van Looy, 2015).

The eighth component of flow is the "transformation of time" (Csikszentmihalyi, 2008; pp. 66-67). In essence, during flow people are susceptible to considerable time distortion; most people report that while in a state of flow time either flies by or, less often, slows down considerably. Many gamers also indicate this tendency and report losing track of time during their gaming or even gaming with this express purpose in mind (Faiola & Vioskounsky, 2007). There is also considerable data to indicate that gamers frequently underestimate their game time with increasing degrees of error as the amount of time played increases (Rau, Peng & Yang, 2006; Tobin & Grondin, 2009; Wood & Griffiths, 2007). Interestingly, the amount by which

time speeds up or slows down is moderated by multiple contextual and individual variables and the effect can extend beyond the active gaming (flow inducing) experience (Luthman, Bliesener & Staude-Muller, 2015).

As gaming has become increasingly collaborative and connected research has also begun to examine the dynamics of flow during group gaming. Interestingly, community flow or "networked flow" often increases perceived belonging and competency (Kaye, 2016). However, community flow is more fragile, often depending on effective verbal communication, cooperation, and task-relevant knowledge of others; when these pieces are in place each member of the team can optimize their contributions to the group while increases the sense of enjoyment and perceived value. This dynamic is incredibly important for new gamers as it provides a buffer to the inherent challenge of gaming and likely contributes to many "newbies" overcoming initial failure experiences to still enjoy flow. At the same time, it can enhance the quality of the gaming experience for more advanced players by opening the opportunity for more challenging, diverse, and/or entertaining activities during gaming.

## Consequences of Video Game Play

While there is an abundance of research indicating potential negative effects of video game play, which tends to be increasingly likely to occur as gaming exposure increases, there is also some evidence that video game play may have positive consequences. For example, positive social, cognitive, emotional, developmental and neuropsychological (Adachi & Willoughby, 2012; Durkin & Barber, 2002; Granic, Lobel & Engels, 2014; Prot et al., 2014) consequences may be observed, especially among youth playing video games. These benefits include improvements in problem solving skills (Adachi & Willoughby, 2013; Blumberg, Rosenthal, & Randall, 2008), enhanced attentional resources (Dye, Green, & Bavelier, 2009),

visual spatial abilities such as mental rotation (Boot, Kramer, Simons, Fabiani & Gratton, 2008) and visual memory (Ferguson, Cruz & Rueda, 2008), and other areas of neurocognitive functioning (Bartlett, Vowels, Shanteau, Crow & Miller, 2009). More recent research has demonstrated that there can be increased functional connectivity in brain regions supporting gaming intensive capabilities, such as "motion detection, visual-auditory multi-tasking and efficient processing of dynamical audiovisual stimuli" (Han, Kim, Bae, Renshaw & Anderson, 2015; p. 8).

Furthermore, increasingly often video games are investigated, developed, and utilized for educational purposes, and may prove to be an ideal avenue for developing various academic, cognitive, and occupational skills, as well as being used for medical, psychotherapeutic, and rehabilitative services (Eigenfeldt-Nielsen, Smith & Tosca, 2016; Gee, 2005; Granic et al., 2014; Jarvin, 2015; O'Connor & Menaker, 2008; Prot et al., 2014). For instance, a recent study in Spain utilized a gaming design for psychoeducation of minors about healthy lifestyles, combined with psychoeducation for parents, that promoted children's knowledge of healthy living and their motivation to use that knowledge over time (Gonzalez, 2016). The efficacy of these kinds of programs may be enhanced with a multiplayer gaming format emphasizing feedback (Burgers et al., 2015) and community flow (Kaye, 2016).

As video games have become an increasingly popular and ubiquitous aspect of modern society, there has been growing concern that gaming may have negative physical, psychological, and behavioral consequences for gamers, especially minors (Prot et al., 2014). This has resulted in an explosion of research relating to a variety of areas of concern, with aggression being the most widely researched including scrutiny from an American Psychological Association Task Force (Calvert et al., 2017; Greitemeyer & Mugge, 2014). It is beyond the scope or purpose of

this research to fully detail the existing literature regarding the connections between violent video game play and aggression, hostility, or real-world violence. Nonetheless, there is considerable research existing to demonstrate that there are significant correlations between violent gaming and violence, although this research has been challenged and there is yet to be overwhelming evidence indicating that playing violent video games independently and directly causes real-world violence (Ferguson, 2013). A less parsimonious, but more realistic perspective, is that violent video games are an important variable among a constellation of contextual, individual, and environmental factors that interact to influence aggression, hostility and violence (Ferguson, Olson, Kutner & Warner, 2014). With that being said, research has demonstrated that increasing realism is directly correlated with increased risk of aggression, leading to increased concern of aggression resulting from gaming, especially as video games become increasingly realistic every year (Bartlett & Rodeheffer, 2009).

There are also concerns that video game play may relate to decreased academic performance (Anand, 2007; Gentile & Stone, 2005; King & Delfabbro, 2009) with some research suggesting that this issue may be most pronounced among pathological gamers (Skoric, Teo & Neo, 2009) although there is also evidence that playing strategy video games may be correlated with positive academic outcomes (Adachi & Willoughby, 2013). Gaming, especially if excessive, may also be associated with sleep deprivation, often resulting in depressive symptoms if left unchecked (Eickhoff et al., 2015), which can contribute to attentional deficits from acute and chronic sleep reduction and deprivation, contributing to declined academic performance (Wolfe et al., 2014). It also appears that excessive gaming is more common in youth with emotional and behavioral difficulties, and that these factors reciprocally detrimentally impact academics performance (Frohlich et al., 2016).

There are also strong associations between gaming and negative physical and mental health outcomes. Multiple studies have identified correlations between gaming and depression, although it is unclear if the relationship is causal or reciprocal (Andreassen et al., 2016; Campbell, 2012; Geisel, Panneck, Stickel, Schneider & Muller, 2015; Weaver et al., 2009). Alexithymia and poorer quality of life are also associated with excessive internet gaming (Geisel et al., 2015). Obesity is another risk factor associated with game time (Gonzalez et al., 2016; Weaver et al., 2009). It is worth noting that these effects can be differentiated by gaming purpose, such that those gaming for escape and/or to build self-esteem, especially during weekdays, are at greater risk of developing medical issues and depressive symptoms (Hellstrom et al., 2015). Pathological gamers have also been found to be at elevated risk of having difficulties with anxiety, isolation, social functioning, cognition, attention, and conduct (Muller et al., 2015).

While there is a growing body of evidence concerning the broad consequences of video game play, both positive and negative, another active area of research concerns problems associated with excessive video game play, most commonly referred to as video game addiction or pathological gaming. This concept was originally suggested in the 1980's (Soper & Miller, 1983) and had been infrequently mentioned in the ensuing decades (Fisher, 1994; Griffiths, 2000) before becoming a major focus of research in the past ten years (APA, 2013; Carbonell, Guardiola, Beranuy & Belles, 2009; Kim et al., 2016; Kuss & Griffiths, 2012). During this time span, increasing efforts have been made to identify a specific disorder associated with excessive and pathological video game play, but no disorder has yet been clearly identified and defined by medical or psychiatric authorities. Until the last few years, there was still little consensus among researchers and practitioners regarding the classification, description, etiology, or even presence

of pathological gaming (APA, 2013; Charlton & Danforth, 2007; Chiu, Lee & Huang, 2004; Gentile, 2009; Hart, et al., 2009; Kim et al., 2016; Ng & Wiemer-Hastings, 2005; Wienstein, 2010; Wood, 2008; Yellowlees & Marks, 2007).

Nonetheless, there is a growing body of literature regarding etiology, assessment, prevalence, incidence, risk factors, comorbidity or treatment with growing emphasis that this issue should be treated as a legitimate mental health concern with reaching impact at an individual, interpersonal, community, and societal level warranting further attention (Kim et al., 2016). While this literature has proposed various models of gaming addiction, the DSM-5 (APA, 2013) suggests that internet gaming disorder is marked by "persistent and recurrent use of the internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) of the following [nine criteria] in a 12-month period" (2013; p. 795-798). These criteria include preoccupation with internet games, tolerance, withdrawal, failed attempts to limit or stop gaming, loss of interest in other pursuits or ventures, continued use despite negative consequences, deception of others to maintain gaming habits, use of gaming as a coping mechanism for negative affect, and loss of or disrupted functioning in the interpersonal, occupational, and/or academic domains. This may also occur in off-line gaming.

The DSM-5 model for Internet Gaming Addiction has been tested empirically with promising initial results and growing support for consensus in the research community (Petry et al., 2014). For instance, among a global sample of over 3,000 gamers, 13.8% were classified as pathological by the DSM-5 criteria (Kim et al., 2016). Among this group, there were elevated risks for mental health issues, concentration difficulties, loneliness, insomnia, impulsivity, and aggression; alarmingly, these individuals were also five times more likely to have attempted

suicide. The criteria also have good sensitivity and specificity, with members of the general population only meeting a criterion 5-15% of the time and pathological gamers identifying with each criterion 60-85% of the time.

In line with the promising findings of the DSM-5's Internet Gaming Disorder (APA, 2013) the majority of research has largely conceptualized video game addiction or pathological gaming either as a parallel to pathological gambling or an impulse control disorder (Kuss & Griffiths, 2012; Park, Kim, Bang, Yoon, Cho & Kim, 2010). Most efforts to classify or diagnose pathological gaming have been based on diagnostic approaches to pathological gambling, and in the past decade numerous validated research tools have been developed to identify gamers with pathological gaming habits (King, Delfabbro & Griffiths, 2011; Gentile, 2009; Kuss & Griffiths, 2012; Lemmens, Valkenburg, & Gentile, 2015; Lemmens, Valkenburg & Peters, 2009). It is also worth noting that there is considerable overlap between the concept of gaming addiction and internet addiction (Block, 2008; Griffiths, 2000; Khan, 2007; Ko, Yen, Chen, Chen & Yen, 2005; Niemz, Griffiths & Banyard, 2005; Whang, Lee & Chang, 2005; Yang & Tung, 2007). Incidentally, there is growing evidence highlighting internet gaming as being more conducive to pathological gaming which also points to increasing concerns for this disorder as gaming becomes increasingly internet dependent (Billieux, Deleuze, Griffiths & Kuss, 2015; Hussain & Griffiths, 2009; Kim Namkoong, Ku & Kim, 2008; Ng & Wiemer-Hastings, 2005).

Prior to the dissemination of the DSM-5 criteria, the most parsimonious, developed, and widely used model for pathological gaming was developed by Lemmens, Valkenburg and Peter (2009) and has considerable overlap with other models of video game addiction and addiction models more generally (Griffiths, 2000; Griffiths & Davies, 2005). This model originally included seven factors (salience, tolerance, mood modification, withdrawal, relapse, conflict, and

problems) which load onto the second order factor of video game addiction when using factor analysis. Thus, each of the factors is an important component of video game addiction but no single factor can be seen as defining video game addiction.

Regarding the specific factors, which combine to establish video game addiction, the first is referred to as salience; this factor relates to a person's preoccupation with gaming and its importance in a gamer's life (Gentile, 2009; Hussain & Griffiths, 2009; King & Delfabbro, 2009; Yee, 2006). An excellent example of salience comes from a case study of marines with pathological gaming issues who were blunted, guarded, and depressed during the interview, except when they were actively talking about video games, in a very enthusiastic, animated manner (Eickhoff et al., 2015).

Tolerance generally refers to gradually or rapidly increasing the required amount of gaming exposure in order to have the same degree of enjoyment; this may escalate to gaming for over ten consecutive hours multiple times per week (Hussain & Griffiths, 2009; Kim Namkoong, Ku & Kim, 2008; King & Delfabbro, 2009; Salguero & Moran, 2002; Yee, 2006). This factor can easily connect to increased time spent gaming, often resulting in sleep deprivation (Eickhoff et al., 2015; Wolfe et al., 2014).

Another important factor in this model is mood modification, which refers to the degree of enjoyment associated with gaming; this may include a subjectively perceived euphoric high or a less arousing degree of relaxation associated with a sense of escape (Griffiths, 2000; Hussain & Griffiths, 2009; Kim et al., 2016; Wood, Gupta, Derevensky & Griffiths, 2004). While enjoyment or fun may be a strong motivator for many gamers, when this shifts to a greater drive for escape, gamers are more likely to game excessively, using gaming as a highly addictive maladaptive coping mechanism (Hellstrom et al, 2015). Interestingly, fun or recreation is more

likely to be endorsed as a primary reason for gaming among the general population and less likely to be endorsed as a primary reason for gaming among pathological gamers, who may be more likely to game to cope or escape from reality (Kim et al., 2016)

In contrast to salience, tolerance, and mood modification, which entail experiences related to gaming, withdrawal refers to experiences which occur in the absence of gaming or when gaming has been substantially reduced. This is most often psychological in nature, including symptoms such as irritability and moodiness although there have also been anecdotal reports of physiological consequences, such as tremors or trembling (Hussain & Griffiths, 2009; King & Delfabbro, 2009). A military case study of several marines presenting with insomnia and depression found pathological gaming to be a critical link between these issues and it was noted by some of those marines that withdrawal from gaming felt subjectively more unpleasant than withdrawal from alcohol (Eickhoff et al., 2015). More recently, the concept of withdrawal has been challenged empirically, as this factor rarely receives sufficient focus in on-going research; in fact, it has been described in "fewer than 50 individuals across five qualitative studies" (Kaptsis, King, Delfabbro & Gradisar, 2016; p. 63). A massive review of available research about gaming finds that it can include symptoms including anxiety, moodiness, depression, irritability, tension, and/or nervousness when unable to game and most often research to irritability or restlessness; inclusion of this factor is relevant, but it may only apply to a subpopulation of pathological gamers.

Often times, individuals attempt to reduce gaming but revert to previous gaming patterns; this is referred to as relapse and is another essential factor in the Lemmens, Valkenburg and Peter model (2009; Hussain & Griffiths, 2009; Lee, Yu & Lin, 2007). For some addicted gamers, success in the game is a self-affirming activity that protects a fragile sense of self; thus,

discontinuing gaming in the absence of other self-affirming activities can be a very risky endeavor that is unlikely to succeed (Beard & Wickham, 2016).

A range of negative consequences can occur in response to excessive gaming; this is measures by two factors in the model. One factor, conflict, refers to interpersonal conflicts such as arguments within or neglect of important relationships. (Chiu, Lee, Huang, 2004; King & Delfabbro, 2009). In contrast to the factor of conflict, the factor of problems refers to disability, impairment, or disruption in any life domain or area of functioning, which typically results from excessive gaming behavior (Gentile, 2009; King & Delfabbro, 2009).

While these factors relate to experiences during, in the absence of, and as a result of game play, they do not specifically deal with the amount of time spent gaming or the fact that pathological gamers tend to spend at least twice as much time gaming per week as casual or recreational gamers (Charlton & Danforth, 2007; Hussain & Griffiths, 2009) spending as little as 20 to as many as 100 hours gaming per week (Gentile, 2009; Kim, et al., 2008; King & Delfabbro, 2009). Many individuals who game this excessively even report that gaming is no longer enjoyable and feels more like a job than a game (King & Delfabbro, 2009; Lee, Yu & Lin, 2007; Yee, 2006). However, some gamers spend large amounts of time gaming and do not report difficulties associated with their gaming. At the same time, this subgroup of gamers may still experience, to a degree similar to that reported by pathological gamers, salience, tolerance and mood modification. This leads to some criticism of the model proposed by Lemmens, Valkenburg and Peters (2009). The most well established criticism of this model is that the factors of salience, tolerance, and mood modification are most strongly related to the concept of flow, and indicate engaged gaming; however, engaged gaming does not equate to pathological gaming (Charlton & Danforth, 2007). Thus it may be difficult to distinguish recreational and

pathological gamers, in terms of conceptualization and self-identification. Recent research has established that flow is a critical aspect of gaming for both engaged and pathological gamers and may be the most robust factor predicting gaming patterns (Campbell, 2012).

This difficulty in identifying pathological gamers and distinguishing them from recreational gamers is further complicated by the lack of standardized assessment instruments or operational definitions (Chiu, Lee & Huang, 2004; King, Haagsma, Delfabbro, Gradisar & Griffiths, 2013; Ko, Yen, Chen, Chen & Yen, 2005; Parker, Taylor, Estabrook, Schell & Wood, 2008). This diagnostic uncertainty is further exacerbated by the unreliability of self-report measures, which are most frequently used in research and clinical settings (Meade & Craig, 2012). This reflects a variety of factors including random responding, careless responding, deliberate distortion of responding, and denial or lack of self-awareness in relation to the specific measures or constructs of concern. For example, review of raw data identified numerous individuals who indicated gaming in excess of 80 hours per week but denied any significant symptoms relating to pathological gaming patterns (Campbell, 2012).

The lack of consensus in the field regarding defining and assessing gaming addiction, likely contributes to the discrepancy in prevalence rates across studies, although factors such as growing occurrence of gaming addiction, sample characteristics, age, and gender, also impact prevalence. A massive ($N$ = 23,533) national sample from Norway found that 7% of the population could be classified as problematic gamers, with elevated risk for males and individuals with depression (Andreassen et al., 2016). Another, international study of high school aged adolescents across Europe assessed gaming pathology with the Internet Gaming Disorder criteria, finding that 1.6% of gamers actively met criteria for the disorder, while as many as 5% more were at high risk of meeting criteria (Muller et al., 2015). When collapsing

data across nationalities, it has been estimated that approximately 8-12% of males and 1-3% of females are estimated to meet criteria for pathological gaming (Gentile, 2009; Salguero & Moran, 2002) regardless of age, although more recent estimates using DSM-5 criteria do not find a significant gender difference (Kim et al., 2016). When taking age into consideration, it appears that 6-8% of youth and adolescents (8-18 years of age) could be classified as pathological gamers (Gentile, 2009; Salguero & Moran, 2002) while as many as 12-16% of the general population might meet criteria for pathological gaming (Griffiths & Hunt, 1998; Grusser, Thalemann & Griffiths, 2007; Kim et al., 2016). Although gaming is more popular among young adults, there does not appear to be a significant generational difference in prevalence rates for pathological gaming, and relationship status, educational status, employment status, and SES do not significantly differ between pathological gamers and the general population (Kim et al., 2016). Game characteristics are also important when considering prevalence rates since as many as two in five gamers in online gaming communities could be classified as addicted (Chalton & Danforth, 2007) and pathological gamers spend much more time online than the general population (Kim et al., 2016).

Available research has also identified a range of negative outcomes associated with excessive gaming, some of which may have a reciprocal relationship with gaming patterns. The most well documented of these negative outcomes relates to aggressive thoughts, feelings, and behaviors and it is clear that pathological gamers have increased exposure to violent video games with increased risk of having problems with aggression (Chiu, Lee & Huang, 2004; Gentile, 2009; Kim et. al., 2016; Lemmens, Valkenburg & Peters, 2011). Another common negative consequence of gaming, especially excessive gaming is decreased academic performance (Chiu, Lee & Huang, 2004; Gentile, 2009; Skoric, Teo & Neo, 2009). Pathological gamers also report

subjective feelings of addiction and may be more likely to develop internet addiction and pathological gambling problems (Gentile, 2009; Griffiths & Wood, 2000; Lee, Yu & Lin, 2007; Parker et al., 2008; Salguero & Moran, 2002). It has also been shown, especially with the growth of MMORPG's and the global interconnectivity of gaming, that many pathological gamers develop a reliance on video games to fulfill social needs, especially if there are social skills deficits (Billieux, Deleuze, Griffiths & Kuss, 2015; Faiola & Vioskounsky, 2007; Weaver, et al., 2009) and this likely is amplified when community flow is present (Kaye, 2016). A range of mental health concerns, particularly depression (Campbell, 2012, Eickhoff et al., 2015), are more likely to occur among pathological gamers and the risk of suicide attempts in this group is five times that of the general population (Kim et al., 2016). While all of these consequences are observed among pathological gamers, it is also possible that these problems may exist prior to and independently of pathological gaming patterns and may even precipitate excessive gaming (Gentile, 2009).

## Potential Theories of the Development of Pathological Gaming

The available research has established a variety of risk factors, which may increase the likelihood of developing pathological gaming patterns. Risk factors relating to environmental circumstances such as boredom, family dysfunctional, or parental permissiveness (i.e. allowing children to have gaming systems in their bedrooms or failing to establish rules about gaming) have been identified by multiple researchers (Charlie, Kyung & Khoo, 2011; Chiu, Lee & Huang, 2004; Gentile, 2009; King & Delfabbro, 2009; Segev et al., 2015). Other research has demonstrated that increasing age and mental health issues are better predictors of pathological gaming than parental attitudes or social factors (Segev et al., 2015). More internalized risk factors include social skills deficiencies and traits relating to sensation seeking, narcissism,

impulsivity, poor time management and organization, and insufficient self-control (Chiu, Lee & Huang, 2004; Griffiths, 2000; Kim et al., 2016; Kim, Namkoong, Ku & Kim, 2008; King & Delfabbro, 2009; Lee, Yu & Lin, 2007; Wood, Gupta, Derevensky & Griffiths, 2004). While there is no stereotypic "gamer" personality type, pathological gamers have more pronounced personality features associated with increased neuroticism and decreased extraversion or conscientiousness (Braun et al., 2016). In addition, it appears that the motives for gaming may be particularly relevant to the occurrence of negative outcomes, with those gaming for entertainment at lower risk and those gaming for coping and ego strengthening at high risk of having problems (Hellstrom, Nilsson, Leppert & Aslund (2012).

Some researchers speculate that the structural characteristics of game play, such as interactivity, anonymity, control, empowerment, recognition and accomplishment and the facilitative social networking qualities of online gaming may contribute to the development of pathological gaming (Griffiths, 2000; King & Delfabbro, 2009; Liu & Peng, 2009). In extension of this research, it has also been suggested that the lack of a natural endpoint, as seen in many online games, may also contribute to excessive gaming habits (Billeux et al., 2015; Hussain & Griffiths, 2009; King & Delfabbro, 2009; Lee, Yu & Lin, 2007; Meredith, Hussain & Griffiths, 2009). Video games are also highly conducive to the experience of flow, and, as such, this could contribute to the development of excessive gaming (Campbell, 2012; Charlton & Danforth, 2007). Interestingly, in spite of games being external stimuli, they can produce effects on the brain similar to substances, with the potential to impact multiple aspects of brain functioning (Han, Kim & Renshaw, 2015). In fact, playing video games can have a dopaminergic effect similar to that caused by psychostimulant drugs, providing strong reinforcement for gaming and creating a reward mechanism explaining addictive gaming behavior (Weinstein, 2010).

The proposal of Internet Gaming Disorder in the DSM-5 has catalyzed some convergence in the literature and there is considerable overlap regarding neuroscientific approaches to measure brain processes as they relate to pathological gaming and it may be that neurobiological factors are as relevant to pathological gaming as substance use disorders (Billieux et al., 2015). A number of critical findings about brain functioning and gaming can be synthesized from this research, regarding both critical brain regions and changes in brain functioning. Strikingly, pathological gaming can modify dopamine pathways (Han, Kim & Renshaw, 2015), impair executive functioning and attention, and "the brain adapts to the perpetual reinforcing stimulation and in turn becomes desensitized to natural reinforcers and thus needs more of the former, putting in motion a vicious cycle" (p. 1521). While some of these changes may be advantageous in that they can be generalized to other activities and processes, most of the changes occurring among individuals with pathological gaming increase the likelihood of excessive gaming and decrease the likelihood of being able to restrict gaming activities (Han et al., 2015; Han et al., 2016).

Regarding brain functioning, compared to healthy gamers, pathological gamers show significant deficits in functional connectivity of the executive control networks, with particular deficits in inhibitory functions (Dong, Lin & Potenza, 2015). In addition, there appears to be significant deficits in decision making capabilities, with excessive gamers often failing to recognize the problems arising from their excessive gaming, or to even see that amount of gaming as being excessive (Dong & Potenza, 2016). In relation to this, pathological gamers are more sensitive to gaming related cues and cravings and less able to recognize the potential loss that can come with gaming while being more sensitive to potential gains, a pattern not unlike that seen in substance use disorders (Ko, Liu & Yen, 2015). Pathological gamers with depression

also show decreased suppression of the default mode network, equated to more perseveration, rumination, hopelessness, and addictive potential (Han et al., 2016). Interestingly, further research regarding dopamine has found that pathological gamers present with marked deficits in $D_5$ receptor functioning while $D_3$ and $D_4$ functioning (commonly implicated in substance use disorders) is relatively unremarkable in comparison to the general population (Vousooghi, Zarei, Shirazi, Eghbali & Zarrindast, 2015). In addition, there appears to be decreased $D_2$ receptor activity in the dorsal striatum (Park & Kim, 2015).

Given all of the relevant brain regions, there are some individuals whose neurobiology make them more likely to struggle with pathological gaming, especially individuals who are easily bored, have impaired inhibition, and struggle with motivational deficits (Chou, Lin, Yang, Yen & Hu, 2015). A number of mental disorders are more highly correlated with these risk factors and pathological gaming, including depression (Andreassen, et al., 2016; Campbell, 2012; Dalbudak & Evren, 2014; Geissel et al, 2015; Han et al., 2015) , OCD (Andreassen et al., 2016; Han, Kim & Renshaw, 2015; Vukosavljevic-Gvozden, Filipovic & Opacic, 2015), and ADHD (Chou et al., 2015; Han, Kim & Renshaw, 2015). While there is considerable consensus regarding depression, there is less available research regarding OCD and somewhat mixed findings regarding ADHD (Andreassen et al., 2016). It should be noted that neurobiological factors associated with ADHD have the greatest overlap with those associated with pathological gaming (compared to depression or OCD) and the chronicity of ADHD symptoms may be particularly relevant to the likelihood of developing and struggling to address pathological gaming (Chou et al., 2015). It is also likely that those struggling with hyperactivity/impulsivity may be more prone to pathological gaming (Dalbudak & Evren, 2014). In spite of this seemingly obvious fit between pathological gaming and ADHD, it is still unclear if ADHD is a

consequence or predictor of excessive gaming, or if the relationship is reciprocal (Gentile, 2009; Kim et al., 2016). However, it has been proposed that youth with ADHD may be able to use gaming as a form of self-medication, making up for dopaminergic deficits with highly engaging activities; taken to the extreme, this can result in behavioral addiction, especially when there are inadequate external supports (Han, Kim & Renshaw, 2015).

The neurobiological research also has clear connections with cognitive theories; this may be most apparent among individuals with OCD and pathological gaming, wherein OCD traits mediate irrational beliefs about the need for gaming, secondary to frustration intolerance often resulting in compulsive behaviors tantamount to excessive game time (Vukosavljevic-Gvozden, Filipovic & Opacic, 2015). In this regard OCD appears to be a critical predictor of pathological gaming, with significant symptoms presenting even before gaming pathology, and worsening of symptoms as gaming pathology progresses (Dong, Lu, Zhou & Zhao, 2011). In relation to this, perfectionism is one of the most noteworthy personality traits cutting across pathological gamers (Forrest, King & Delfabbro, 2016). What is even more interesting is that systematic assessment of gaming related cognitions may be a better predictor of pathological gaming than gaming time alone. This can also clearly connect to problems related to gaming as "it may not be the case that gamers are 'too busy' playing video-games to meet their other commitments, but that video-games dominate thoughts to such an extent that they are unable to concentrate on anything else when not playing" (p. 403). The relevance of gaming related beliefs can be parsimoniously condensed to beliefs about easy access to engaging activities, rigid rules about gaming (ritualistic play), gaming as a source of self-esteem and ego protection, and gaming as a means of social acceptance (King & Delfabbro, 2014).

From a behavioral perspective, gaming, especially in an online venue, can be seen as a form of operant conditioning, using a variable-ratio reinforcement schedule, which is enhanced by providing social reinforcement in player-to-player interactions (Charlton & Danforth, 2007; Liu & Peng, 2009). On the other hand, pathological gaming may represent a coping mechanism gone awry to deal with issues such as depression, loneliness, or social anxiety; unfortunately, this same coping mechanism may actually contribute to the very problems it is intended to cope with, contributing to a cyclical addictive pattern (Campbell, 2012; Caplan, 2003; Davis, 2001; Kim et al., 2016; Liu & Peng, 2009; Wood, 2008; Wood, Gupta, Derevensky & Griffiths, 2004). Other researchers have suggested that poor self-regulation skills, impulsivity, and distorted time perception precipitate pathological gaming as well as exacerbate the development of negative consequences associated with such excessive gaming (Kim, Namkoong, Ku & Kim, 2008; Liu & Peng, 2009; Wood, 2008, Wood & Griffiths, 2007). Furthermore, time distortion is commonly experienced during video game play and this distortion tends to be greater as the amount of gaming time increases; thus, gamers frequently underestimate the amount of time invested in their gaming (Anand, 2007).

Building off of some of the cognitive and behavioral research, self-determination theory provides another framework to conceptualize the etiology and perpetuation of gaming behaviors, which can be extended to pathological gaming. The finding that motives for gaming can specifically predict risk of gaming problems speaks to the importance of attending to this model (Hellstrom et al., 2012). There is growing support for the notion that gaming contingent self-worth is a critical factor to identifying and addressing video game addiction (Beard & Wickham, 2016). This refers to the notion that individuals, especially those who have low self-esteem may combat this insecurity with high self-worth established while gaming and anchor their self-worth

in the success and value derived from gaming experiences. These gamers are more likely to endorse achievement, socialization, and immersion as primary motives for gaming and often present with obsessive, passionate engagement in gaming, with rigid game play styles emphasizing validation seeking, a reward orientation, and a competitive focus. In relation to this, motivation to game can be directly impacted by the current gaming experiences, such that satisfying gaming experiences increase acute motivation and, paradoxically, frustrating gaming experiences can also increase acute motivation (Burgers, 2015). It is worth noting that the latter pattern is only seen when the gamer is already well invested in gaming and has an established sense of competency, allowing for the frustrating feedback to be reframed into a challenge, rather than a pure statement of failure; alternatively, the short-term failure may be tolerated and resisted at the threat of losing gaming contingent self-worth (Beard & Wickham, 2016). This may be even more relevant for online gaming, where the perpetual opportunity for new competition heavily influences a gamer's sense of self-worth, while the relevance may actually be attenuated in offline, isolated gaming environments (Kazakova et al., 2014).

## Interventions for Pathological Gaming

While research regarding the etiology, classification, and assessment of pathological gaming has been developing steadily over the past decade, research regarding the treatment of pathological gaming is far less developed. It has been argued that there are a range of symptomatic, etiological, and neurobiological similarities between pathological gaming and substance use disorders, and, as such, a range of treatments for substance use disorders could be modified to treat pathological gaming (Smith, Hummer & Hulverson, 2015). In this line of thinking, there is preliminary support for the use of certain medications, such as bupropion, (Han & Renshaw, 2011; Ko, Liu & Yen, 2015) or psychotherapy, such as CBT, (van Rooij & Zinn,

2012) which have been shown to have some beneficial effect, at least in the short-term. In connection with available neurobiological research, it appears that increasing activity in the DLPFC and dopamine in the cortico-striatal pathway improves the ability to tolerate withdrawal from gaming and bupropion and/or escitalopram can produce these results (Han, Kim & Renshaw, 2015). In the past few years, more innovative approaches, such as virtual reality therapy, have been explored, and may even have benefits comparable to more mainstream approaches like CBT (Park et al., 2016). However, the paucity of intervention research is even more evident by the absence of data regarding factors involved in treatment of pathological gaming or factors interfering with effective treatment, such as self-awareness of problem gaming or help-seeking behaviors needed to bring about real change; these factors are essential to development of effective treatments of any modality (Beranuy, Carbonell, & Griffiths, 2013; Prochaska & Norcross, 2010).

Much of the promise for treatment research in the realm of pathological gaming is derived from similar research in the realms of internet addiction (van Rooij et. al., 2012) and pathological gambling (Wohl, Santesso & Harrigan, 2013). For example, Wohl, Santesso and Harrigan (2013) created a short video clip explaining certain aspects of pathological gambling and suggesting some behavioral changes to combat this problem and presented it to many pathological gamblers; their findings indicated that there is some immediate benefits from this kind of exposure in terms of self-awareness and actual behavioral change. It would stand to reason that similar approaches may also be beneficial for problems such as video game addiction.

Consequently, one of the primary objectives of this research is to pilot a brief psychoeducational piece to serve as both a preventive measure and a form of intervention for

pathological gaming. Secondary objectives relate to expanding the available research on diagnosis and assessment of gaming addiction as well as factors promoting or prohibiting self-diagnosis and help-seeking behaviors in those struggling with pathological gaming. Thus, the primary hypothesis is that exposure to a brief piece of psychoeducational material will increase self-awareness of problematic gaming patterns and promote help-seeking behavior.

# CHAPTER II

# METHOD

## Participants

Participants were recruited online via social media sites with content related to video games. The purpose of this approach was to capture a sample saturated with gaming related behaviors. In addition, this approach allowed access to a more heterogeneous sample of national and potentially international respondents. This also allowed for a larger population pool and the greater sample size. Participants were informed of the option to provide email addresses for entries into a drawing for a $10.00 Amazon gift card. Participants were provided informed consent and the project received IRB approval.

The total sample ($N$ = 881) varied in Gender (Men = 87.2%; Women = 11.1%; Other = 1.5%), age ($M$ = 23.1, $SD$ =5.4; Range = 18-65), and ethnic diversity (Caucasian, 82.2%; American Indian/Alaskan Native, 1.4%; Hispanic, 7.0%; African American, 1.8%; Asian, 9.3%; or Other, 3.1%). Table 1 provides additional information regarding the sample composition. Subsets of the final sample were also identified as students (47.0%) and millennials (75% between ages 18 & 29) who were employed (45.3%) and involved in a romantic relationship (28.6%).

Table 1
Various Demographic Variables

| | Variable | N (% of sample) |
|---|---|---|
| **Race/ Ethnicity** | African American/Black | 16 (1.8%) |
| | American Indian/Alaskan Native | 12 (1.4%) |
| | Asian American/Asian | 85 (9.6%) |
| | Caucasian/White | 724 (82.2%) |
| | Hispanic/Latino | 62 (7.0%) |
| | Hawaiian or Pacific Islander | 5 (0.6%) |
| | Multiracial or Other | 27 (3.1%) |
| **Sexual Orientation** | Heterosexual | 737 (83.8%) |
| | Bisexual | 59 (6.7%) |
| | Lesbian | 4 (0.5%) |
| | Gay | 17 (1.9%) |
| | Other Sexual Orientation | 37 (4.2%) |
| | Prefer not to answer for Sexual Orientation | 26 (3.0%) |
| **Relationship Status** | Single | 535 (60.7%) |
| | Serious Dating or Committed Relationship | 12 (1.4%) |
| | Married | 242 (27.5%) |
| | Separated | 79 (9.0%) |
| | Divorced | 3 (0.3%) |
| | Other | 10 (1.1%) |
| **Student Status** | Full Time Student | 360 (40.9%) |
| | Part Time Student | 54 (6.1%) |
| **Employment Status** | Full Time Employment | 262 (29.7%) |
| | Part Time Employment | 137 (15.6%) |
| | Retired | 1 (0.01%) |
| | Unemployed | 179 (20.3%) |

## Measures

### Demographics Questionnaire

A demographics questionnaire assessing variables relating to age, ethnicity, gender, education and other demographic variables was included (Campbell, 2012). This questionnaire was used to assess the variable of Gender, among others.

### Video Game History Questionnaire

A questionnaire detailing participants' history of gaming, amount of time spent gaming, and experiences gaming was created based on previous research by this author (Campbell, 2012). This questionnaire was used to assess the variables of Hours Online (hours per week in online gaming), Hours Offline (hours per week in offline gaming) and Longest Gaming Session (longest consecutive period of time for a gaming session).

### Gaming Engagement Questionnaire (GEQ)

The Gaming Engagement Questionnaire (GEQ; Brockmeyer, Fox, Curtiss, McBroom, Burkhart & Pidruzny, 2009) is a 19-item Likert-like scale questionnaire designed to assess various aspects of engagement during gaming experiences. The GEQ can be modified to apply to any specified time frame of interest. The GEQ was developed using Rasch and classical analyses and research utilizing this questionnaire has found strong overlap between the GEQ and the factors of salience, tolerance, and mood modification as described by Lemmens, Valkenburg and Peters (2009) in their model for pathological gaming (Campbell, 2012; Charlton & Danforth, 2007). Initial validation of the scale demonstrated good internal consistency (Cronbach's alpha=.85), reasonable test-retest reliability ($r$=.72) and adequate predictive validity (fit of categories assessed close to expected value of 1.0) (Brockmeyer et al., 2009). This questionnaire was used to assess the variable of Gaming Flow (total raw GEQ score).

**Video Game Addiction Scale (VAS)**

The video game addiction scale (Lemmens, Valkenburg & Peters, 2009) is a 21-item, 5-point Likert-like scale created to assess pathological gaming. The questionnaire was created using structural equation modeling to create seven factors (salience, tolerance, mood modification, relapse, withdrawal, conflict, and problems) which load onto the higher order factor of pathological gaming with each item having adequate loadings on its specific factor and the higher order factor of pathological gaming. Of note, this scale has also been shown to have strong conceptual overlap with the DSM-5 criteria for internet gaming disorder and is generally superior to other measures of similar constructs in this regard (King et al., 2013). This measure has adequate reliability for research purposes (Cronbach alpha ranging from .70 to .84; Haagsma et al., 2012; Lemmens et al., 2009; Lemmens et al., 2011; Mentzoni, 2011). There is evidence of strong convergent validity with statistically significant correlations with at least seven different clinical constructs including loneliness, life satisfaction, social competence, aggression, sensation seeking, anxiety and depression (King et al., 2013; Lemmens, et al., 2009; Lemmens, Valkenburg & Peter, 2011).

In addition, the short-form (7-items) also shows good reliability in multiple samples (Chronbach's alpha ranging from 0.84 to 0.90; Brunborg, Mentzoni & Froyland, 2013; Mentzoni et al., 2011; van Rooij et al., 2012). While Lemmens and colleagues have not established a specific cut-off score to identify pathological gaming, high scores indicate greater degrees of problems and mean scores above 3 are strongly indicative of pathological gaming (Lemmens, et al., 2011). While the VAS was originally developed using Dutch adolescents it has been used by a growing number of researchers in various settings and was one of the most commonly used measures for gaming pathology when this research was being proposed (Campbell, 2012;

Griffiths, 2010; Haagsma et al., 2012; Lemmens et al., 2011; Sanders, et al., 2010.). This questionnaire assessed variables including Initial Pathology (total VAS raw score at outset of participation), Post-Test Pathology (total VAS raw score after Intervention), and Follow-Up Pathology (total VAS raw score at 30 day follow-up).

**Depression Anxiety Stress Scales (DASS)**

The depression anxiety stress scales is a 42-item questionnaire designed to measure various aspects of negative emotional valence or functioning, primarily depression, anxiety, and stress (Lovibond & Lovibond, 1995). The DASS has been demonstrated to have good internal consistency for each scale, including Depression (Chronbach alpha = 0.91) and Anxiety (Chronbach alpha = 0.84). This measure has been This questionnaire can be utilized to assess symptoms of distress even if they are not severe enough to warrant clinical attention. This measure assessed the variables of Depression (total raw score for 14 DASS items in the depression subscale) and Anxiety (total raw score for 14 DASS items in the anxiety subscale). This measure is available online (http://www.psy.unsw.edu.au/dass/) for free access and use and the website includes a lengthy, yet partial, list of publications demonstrating its validity and reliability, which the reader may refer to for additional details.

**Barkley Adult ADHD Rating Scale-IV (BAARS-IV)**

The BAARS-IV is a 27 item self-report measure designed to assess overall ADHD symptoms (consistent with DSM-5 criteria) as well as ADHD symptom clusters including inattention, impulsivity, hyperactivity and sluggish cognitive tempo (Barkley, 2011). The manual extensively details the history and construction of this scale, as well as reviewing its psychometric properties. In particular, the subscales each has adequate to strong internal consistency (Cronbach's alpha ranging from .776 to .940) adequate test-retest reliability (Pearson

r ranging from .66 to .88 across subscales over a two to three week period). This measure assessed variables for Total ADHD symptoms as well as Inattention, Impulsivity, and Hyperactivity.

**Psychoeducational Materials**

Three psychoeducational videos were be created using goanimate (2014) and the videos are accessible through Youtube.com (see Appendix with transcript of content and hyperlinks). The Neutral Support Group video (Appendix I) consisted of a three minute excerpt of a fictional support group, with three members spending one minute each introducing themselves and relating their struggles with various addictions; none of these members mentioned pathological gaming. The Gaming Support Group video (Appendix II) consisted of a three minute excerpt of a fictional support group, with three members spending one minute each introducing themselves and relating their struggles with various addictions; the last group member in this video specifically discusses pathological gaming. The Diagnostic Awareness video (Appendix III) consisted of a three minute discussion of pathological gaming characteristics based on the proposed criteria for Internet Gaming Disorder in the DSM-5 (APA, 2013).

## Procedures

Participants were recruited online from reddit.com with moderator approved posts about the research. After providing consent to participate, all participants completed a demographics questionnaire, video game history questionnaire, GEQ, VAS (Initial), DASS, and BAARS-IV. Participants were randomly assigned to one of three Intervention conditions, Diagnostic Awareness video, Gaming Support Group video, or Neutral Support Group video, or a 3-minute waiting period. Following exposure or wait period, participants were asked several simple multiple choice questions to identify random or careless responders and attention to the research.

Participants then completed the VAS (Post-Test) and were provided the option to participate in a follow-up questionnaire 30 days later, with additional incentive (four extra entries to gift card drawings). At follow-up participants were asked to complete the VAS (Follow-Up) again as well as open-ended questions relating to any Help-Seeking Behaviors since initial participation in the study. Because of the online nature of the study, participants were able to complete all measures in whatever location they desired, via the internet. While there has been some concern about poor data quality for online self-report measures regarding pathological gaming (Meade & Craig, 2012) a growing number of researchers in this domain are using this approach and there is some rationale to using this approach. In particular, given that pathological gaming may have a low base rate and be difficult to distinguish from avid gaming, it makes sense to sample from a population saturated with both avid and addicted gamers (Hussain & Griffiths, 2009; Meredith, Hussain & Griffiths, 2009).

## Hypotheses and Analytic Strategies

A number of different hypotheses were generated relating to relationships between several groups of variables. Independent variables were Gender, Intervention, and within group variables constructed from Initial VAS and Post VAS scores (Pre-Post VAS) or Initial VAS and Follow-Up VAS scores (Pre-Follow-Up VAS); when a within group design was not possible, Initial VAS (Initial Pathology) often served as a covariate. Dependent variables were Post-Test VAS scores (Post-Test Pathology), Follow-Up VAS scores (Follow-Up Pathology) and Help-Seeking Behavior. Gaming distress indicators included Hours Online, Hours Offline, Longest Gaming Session, and Gaming Flow (as measured by the GEQ). Mental health indicators included Depression and Anxiety (both measured by the DASS) as well as Inattention, Hyperactivity, and Impulsivity (three subscales of the BAARS-IV). The overall analytic strategy

emphasized identification of group differences due to gender ($H_1$) and then degree of relationship between critical variables for Initial Pathology ($H_2$), Post-Test Pathology ($H_3$), and Follow Up Pathology ($H_4$). After addressing these analyses, the strategy shifted to identifying the significance of group differences with regard to Intervention and Pre-Post VAS ($H_5$) and Pre-Follow-Up VAS ($H_6$) and finally prediction of group membership for Initial Pathology ($H_7$) and Help-Seeking Behavior ($H_8$). Given the range of hypotheses and variable types included, the specific analytic strategy is specified with regard to each hypothesis.

**Hypothesis 1**

Gender differences in the bivariate associations found between the distress indicators and Initial Pathology, Post-Test Pathology, or Follow-Up Pathology would not be found. Fisher *z* transformation tests were be used to assess whether any bivariate correlation coefficient strength differs by Gender.

**Hypothesis 2**

Initial Pathology would be significantly associated with all of the gaming-related (Hours Online, Hours Offline, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattention, Hyperactivity, and Impulsivity) distress indicators. This hypothesis was tested through simple bivariate correlation coefficients and general regression analysis to determine which predictors accounted for unique variance in Initial Pathology.

**Hypothesis 3**

Post-Test Pathology would be significantly associated with all of the gaming-related (Hours Online, Hours Offline, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattention, Hyperactivity, and Impulsivity) distress indicators after controlling for variance associated with Initial Pathology. This hypothesis was tested through

simple partial bivariate correlation coefficients that controlled for the Initial Pathology. Regression analysis, including Initial Pathology, was used to determine which predictors accounted for unique variance in Post-Test Pathology.

**Hypothesis 4**

Follow-up Pathology would be significantly associated with all of the gaming-related (Hours Online, Hours Offline, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattention, Hyperactivity, and Impulsivity) distress indicators after controlling for variance associated with Initial Pathology. This hypothesis was tested through simple partial bivariate correlation coefficients that controlled for the Initial Pathology. Regression analysis, including Initial Pathology, was used to determine which predictors accounted for unique variance in Follow-Up Pathology.

**Hypothesis 5**

Post-Test Pathology would differ significantly as a function of the following Intervention group assignments Gaming Support Group > Diagnostic Awareness > Neutral Support Group > Control (wait-period). Neither the Gender nor Gender by Intervention effect would be significant. A 2 (Gender) x 4 (Intervention) x 2 (Pre-Post VAS) ANCOVA was used to assess Gender, Intervention, and Pathology change effects (including all of the interactions). A separate ANCOVA was conducted using the same variables and any gaming-related or mental health distress indicators found significant in the Post-Test Pathology regression analysis ($H_3$) as covariates.

**Hypothesis 6**

Follow-up Pathology will differ significantly as a function of the following intervention group assignments Gaming Support Group > Diagnostic Awareness > Neutral Support Group >

Control (wait-period). A 2 (Gender) x 4 (Intervention) x 2 (Pre-Post VAS) ANCOVA was used to assess Gender, Intervention, and Pathology change effects (including all of the interactions). A separate ANCOVA was conducted using the same variables and any gaming-related or mental health distress indicators found significant in the Follow-Up VAS regression analysis ($H_4$) as covariates.

**Hypothesis 7**

Pathological Gamers (Initial VAS > 63) would be differentiated from control respondents (Initial VAS <= 63) by the gaming-related (Hours Online, Hours Offline, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattention, Hyperactivity, and Impulsivity) distress indicators. Logistic regression was used to assess which of the gaming-related and mental health distress indicators were predictive of Pathological Gaming group assignment.

**Hypothesis 8**

Help-seeking gamers would be differentiated from non-help-seeking gamers by Initial Pathology, Intervention and gaming-related related (Hours Online, Hours Offline, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattention, Hyperactivity, and Impulsivity) distress indicators. Logistic regression was used to assess which of the condition groups and gaming-related and mental health distress indicators were predictive of help-seeking.

# CHAPTER III

# RESULTS

## Participants

The participant sample examined in this study was comprised of a random subset of gamers using the reddit.com platform over a four month period from December 1, 2015 to March 5, 2016. Participants were recruited from over 25 gaming related subreddits with a moderator approved post inviting them to participate in a brief survey with an incentive of a chance to win a $10 amazon.com gift card. As many as 1.7 million reddit users (calculated as sum of subscribed members to each of the gaming related subreddits) could have seen these posts, though in all probability a far smaller number actually saw and read the invitation. A total of 881 reddit.com gamers met the inclusion criteria which included completion of the initial VAS. A subset of reddit.com gamers (n=660) were not included in the sample since they accessed, but quickly disengaged from, the survey. A total of 46.9% (*n*=413) of the sample completed the intervention and post testing. Only 16.1% (*n*=142, 34.4% of the post-test sample) of the original sample completed the one-month follow up.

## Descriptive Statistics

On average participants began gaming between age six and seven, and spent an average of 13.1 and 17.4 hours in respective weekly offline and online gaming. The average longest gaming session was 13.9 hours, with 13.3% of the sample reporting gaming sessions that

extended more than 24 hours. Additional data for variables relating to gaming habits and mental health can be seen in Table 2.

Table 2
Critical Gaming Related Variables

| Variable | N (% sample) | Mean (SD) |
|---|---|---|
| Age to begin gaming | 875 (99.3%) | 6.41 (3.51) |
| Inattention | 593 (67.3%) | 15.26 (5.84) |
| Hyperactivity | 595 (67.5%) | 7.96 (3.04) |
| Impulsivity | 595 (67.5%) | 5.90 (2.49) |
| Overall ADHD symptoms | 593 (67.3%) | 29.11 (9.80) |
| Depression | 666 (75.6%) | 25.24 (11.49) |
| Anxiety | 667 (75.7%) | 19.39 (6.65) |
| Stress Score | 667 (75.7%) | 23.99 (9.00) |
| Total DASS Score | 661 (75.0%) | 68.55 (24.91) |
| Gaming Flow | 872 (99.0%) | 48.20 (11.69) |
| Hours Offline | 880 (99.9%) | 13.11 (14.30) |
| Hours Online | 879 (99.8%) | 17.36 (17.15) |
| Total Gaming Time | 878 (99.6%) | 30.42 (22.52) |
| Longest Gaming Session | 881 (100.0%) | 13.94 (9.92) |
| Initial Pathology | 865 (98.2%) | 50.98 (13.90) |
| Post-Test Pathology | 413 (46.9%) | 45.58 (16.11) |
| Follow-up Pathology | 142 (16.1%) | 48.48 (13.35) |

## Gender Differences ($H_1$)

Given the preponderance of data indicating differences between male and female gamers and the considerable difference in sample size between male and female gamers, gender differences were screened across the most significant variables in relation to three critical points of data collection (pre, post, and follow-up VAS) using Fisher Z transformation scores (see Table 3). Few significant differences were found. However, males had significantly larger correlations between ADHD and VAS scores at initial and post-test data points; interestingly, males also had a significantly larger correlation between online gaming and VAS scores, but only at the follow-up data point.

Table 3

Comparison of Fisher Z scores for critical distress covariates by gender ($H_1$)

| Initial VAS Score | | | | |
|---|---|---|---|---|
| Gender→ | Male: r (N) | Female: r (N) | Fisher Z | P (2-tailed) |
| Hours Online | .178 (752)** | .271 (97)** | -0.9 | .3681 |
| Hours Offline | .094 (752)** | .200 (97)* | -0.99 | .3222 |
| Longest Gaming Session | .136 (753)** | .306 (97)** | -1.64 | .101 |
| Gaming Flow | .706 (747)** | .725 (97)** | -0.36 | .7188 |
| Depression | .434 (567)** | .446 (85)** | -0.13 | .8966 |
| Anxiety | .521 (567)** | .387 (85)** | 1.43 | .1527 |
| Inattention | .574 (501)** | .375 (77)** | 2.08* | .0375 |
| Hyperactivity | .431 (503)** | .259 (77)* | 1.57 | .1164 |
| Impulsivity | .354 (503)** | .289 (77)* | 0.58 | .5619 |
| Post VAS Score | | | | |
| Gender→ | Male: r (N) | Female: r (N) | Fisher Z | P (2-tailed) |
| Hours Online | .122 (346)* | .287 (58)* | -1.19 | .234 |
| Hours Offline | .083 (345) | .189 (58) | -0.74 | .4593 |
| Longest Gaming Session | .094 (346) | .274 (58)* | -1.29 | .1971 |
| Gaming Flow | .656 (345)** | .729 (58)** | -0.97 | .332 |
| Depression | .544 (344)** | .605 (58)** | -0.63 | .5287 |
| Anxiety | .642 (345)** | .536 (58)** | 1.12 | .2627 |
| Inattention | .690 (344)** | .466 (57)** | 2.34* | .0193 |
| Hyperactivity | .538 (345)** | .308 (57)* | 1.93 | .0536 |
| Impulsivity | .462 (345)** | .332 (57)* | 1.06 | .2891 |
| Follow Up VAS Score | | | | |
| Gender→ | Male: r (N) | Female: r (N) | Fisher Z | P (2-tailed) |
| Hours Online | .320 (116)** | -.219 (23) | 2.28* | .0113 |
| Hours Offline | .021 (116) | .161 (23) | -0.58 | .5619 |
| Longest Gaming Session | .085 (116) | .156 (23) | -0.3 | .7642 |
| Gaming Flow | .563 (116)** | .649 (23)** | -0.56 | .5755 |
| Depression | .392 (116)** | .359 (23) | 0.16 | .8729 |
| Anxiety | .501 (116)** | .318 (23) | 0.91 | .3628 |
| Inattention | .398 (115)** | .294 (23) | 0.49 | .6241 |
| Hyperactivity | .252 (115)** | .553 (23)** | -1.5 | .1336 |
| Impulsivity | .191 (115)* | .420 (23)* | -1.05 | .2937 |

** $p<.01$

* $p<.05$

** and * in columns two and three reflect significance of correlation of variable to VAS score

### Regression Analyses ($H_2$, $H_3$, $H_4$)

A multiple regression model was tested to assess the extent to which Initial Pathology scores could be predicted from the gaming-related (Hours Offline, Hours Online, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattentive, Hyperactivity, and Impulsivity) distress indicators. Data screening led to the elimination of 19 cases as multivariate outliers. This model accounted for a significant amount of the variance in Initial Pathology, $R^2 = 0.594$, $R^2_{adj} = 0.587$, $F$ (9, 549) = 89.187, $p < .001$. Four variables, Gaming Flow $\beta = .563$, $t$ (549) = 18.017, $p < .001$, Hours Online $\beta = .157$, $t$ (549) = 5.483, $p < .001$, Inattention $\beta = .178$, $t$ (549) = 4.273, $p < .001$, and Anxiety $\beta = .105$, $t$ (549) = 2.354, $p = .019$, significantly contributed to the model. After controlling for other variables, Gaming Flow uniquely accounted for 37.2% of the variance in Initial Pathology, while Online Gaming, Inattention, and Anxiety each uniquely accounted for 5.2%, 3.2%, and 1% of the variance, respectively (Table 4).

A multiple regression model was tested to assess the extent to which Post-Test Pathology scores could be predicted from the gaming-related (Hours Offline, Hours Online, Longest Gaming Session, Gaming Flow, Initial Pathology Score) and mental health (Depression, Anxiety, Inattentive, Hyperactivity, and Impulsivity) distress indicators. Data screening led to the elimination of 11 cases as multivariate outliers. This model accounted for a significant amount of the variance in Post-Test Pathology, $R^2 = 0.838$, $R^2_{adj} = 0.834$, $F$ (10, 376) = 194.424, $p < .001$. Four variables, Initial Pathology $\beta = .750$, $t$ (376) = 23.391, $p < .001$, Inattention Score $\beta = .098$, $t$ (376) = 2.835, $p = .005$, Impulsivity Score $\beta = .071$, $t$ (376) = 2.787, $p = .006$, and Depression $\beta = .087$, $t$ (376) = 2.634, $p = .009$, significantly contributed to the model. After controlling for other variables, Initial Pathology uniquely accounted for 59.3% of the variance in

Post-Test Pathology scores, while Inattention, Impulsivity, and Depression each uniquely accounted for 0.3%, 0.1%, and 0.4% of the variance, respectively. In contrast to the previous analysis, Online Gaming and Anxiety were no longer significant, and each uniquely contributed to 2% and 1.8% of the variance in Post-Test pathology, respectively (Table 5).

A multiple regression model was tested to assess the extent to which Follow-Up Pathology scores could be predicted from the gaming-related (Hours Offline, Hours Online, Longest Gaming Session, Gaming Flow, Initial Pathology Score) and mental health (Depression, Anxiety, Inattentive, Hyperactivity, and Impulsivity) distress indicators. Data screening led to the elimination of 1 case as a multivariate outlier. This model accounted for a significant amount of the variance in Follow-Up Pathology, $R^2 = 0.730$, $R^2_{adj} = 0.709$, $F$ (10, 130) = 35.081, $p <$ .001. One variable, Initial Pathology $\beta = .824$, $t$ (130) = 12.04, $p < .001$, significantly contributed to the model. After controlling for other variables, Initial Pathology uniquely accounted for 52.5% of the variance in Follow-Up Pathology scores, while all other variables were non-significant and each uniquely accounted for less than 1% of the variance (Table 6).

Table 4
Regression Coefficients for Model Variables from Hypothesis 2

| Variable | ***B*** | *β* | *t* | *p* | Bivariate *r* | Partial *r* |
|---|---|---|---|---|---|---|
| Online Gaming | .140 | .157 | 5.483 | <.001 | .181 | .228 |
| Offline Gaming | .005 | .005 | .176 | .861 | .105 | .007 |
| Longest Gaming Session | -.051 | -.030 | -1.027 | .305 | .129 | -.044 |
| Gaming Flow | .679 | .563 | 18.017 | <.001 | .705 | .610 |
| Depression | .100 | .082 | 1.906 | .057 | .433 | .081 |
| Anxiety | .233 | .105 | 2.354 | .019 | .492 | .100 |
| Inattention | .456 | .178 | 4.273 | <.001 | .519 | .179 |
| Hyperactivity | -.303 | -.060 | -1.595 | .111 | .366 | -.068 |
| Impulsivity | .280 | .047 | 1.372 | .171 | .316 | .058 |

Table 5
Regression Coefficients for Model Variables from Hypothesis 3

| Variable | ***B*** | *β* | *t* | *p* | Bivariate *r* | Partial *r* |
|---|---|---|---|---|---|---|
| Online Gaming | -.021 | -.022 | -.960 | .338 | .154 | .142 |
| Offline Gaming | .010 | .009 | .431 | .667 | .101 | -.049 |
| Longest Gaming Session | .044 | .026 | 1.167 | .244 | .155 | .022 |
| Gaming Flow | .048 | .038 | 1.291 | .198 | .634 | .060 |
| Depression | .112 | .087 | 2.634 | .009 | .522 | .066 |
| Anxiety | .088 | .037 | 1.042 | .398 | .559 | .135 |
| Inattention | .245 | .091 | 2.835 | .005 | .589 | .054 |
| Hyperactivity | -.071 | -.013 | -.472 | .638 | .404 | .145 |
| Impulsivity | .450 | .071 | 2.787 | .006 | .390 | -.024 |
| Initial Gaming Pathology | .800 | .750 | 23.391 | <.001 | .895 | .770 |

Table 6
Regression Coefficients for Model Variables from Hypothesis 4

| Variable | ***B*** | *β* | *t* | *p* | Bivariate *r* | Partial *r* |
|---|---|---|---|---|---|---|
| Online Gaming | .027 | .032 | 0.641 | .523 | .192 | .056 |
| Offline Gaming | -.012 | -.010 | -0.214 | .831 | .030 | -.019 |
| Longest Gaming Session | -.004 | -.002 | -0.047 | .962 | .080 | -.004 |
| Gaming Flow | -.023 | -.020 | -0.305 | .761 | .577 | -.027 |
| Depression | .055 | .045 | 0.685 | .494 | .373 | .060 |
| Anxiety | .064 | .029 | 0.389 | .698 | .437 | .034 |
| Inattention | -.077 | -.032 | -0.468 | .640 | .376 | -.041 |
| Hyperactivity | .133 | .026 | 0.451 | .653 | .292 | .039 |
| Impulsivity | .288 | .049 | 0.920 | .359 | .212 | .080 |
| Initial Gaming Pathology | .819 | .824 | 12.004 | <.001 | .850 | .725 |

## Analyses of Covariance ($H_5$, $H_6$)

A 2 (Gender) x 4 (Intervention condition) x 2 (Pre-Post VAS scores [within subject factor]) mixed design ANCOVA was conducted to determine the effects of these factors and their interactions on changes in Gaming Pathology between the initial and post-test measurements. A main effect was found, such that there was a significant change in Gaming Pathology, $F$ (1,384) = 74.991, $p$ < .001 partial $\eta^2$=.165. There was no significant interaction between changes in Gaming Pathology scores and Intervention condition, $F$ (3,384) = 0.170, $p$ = .917 partial $\eta^2$=.001 and no significant effect of Intervention condition on Gaming Pathology, $F$ (3,384) = 1.251, $p$ = .291 partial $\eta^2$=.010. There was no significant three-way interaction, $F$ (3,384) = 0.335, $p$ = .800 partial $\eta^2$=.003 and no significant effect of Intervention condition and Gender on Gaming Pathology, $F$ (3,384) = 1.185, $p$ = .315 partial $\eta^2$=.009 (Table 7). The above analysis was repeated using the identified covariates (Depression, Inattentiveness, and Impulsivity) from the regression analysis for hypothesis 3. A main effect was found, such that there was a significant change in Gaming Pathology, $F$ (1,376) = 113.119, $p$ <.001, partial $\eta^2$=.165. There were significant interactions and effects for each of the covariates while there was no significant change to the interactions or effects for Intervention condition or Gender and Intervention condition on Gaming Pathology (Table 8).

A 2 (gender) x 4 (Intervention condition) x 2 (Pre-Follow Up VAS scores [within subject factor]) mixed design ANCOVA was conducted to determine the effects of these factors and their interactions on changes in Gaming Pathology between the initial and one month follow-up measurements. No main effect was found for change in Gaming Pathology, $F$ (1,131) = 2.203, $p$ = .140 partial $\eta^2$=.017. There was no significant interaction between changes in Gaming Pathology scores and Intervention condition, $F$ (3,131) = 1.960, $p$ = .123 partial $\eta^2$=.043 and no

significant effect of Intervention condition on Gaming Pathology, $F$ (3,131) = 0.375, $p$ = .771, partial $\eta^2$=.009. There was no significant three-way interaction, $F$ (3,131) = 1.636, $p$ = .184 partial $\eta^2$=.036 and no significant effect of Intervention condition and Gender on gaming pathology, $F$ (3,131) = 0.718, $p$ = .543 partial $\eta^2$=.016 (Table 9). A second analysis including covariates was not conducted as the only significant covariate in the relevant regression analysis was Initial Pathology.

Table 7
ANCOVA for Hypothesis 5 (no covariates)

| Interactions | | | | |
|---|---|---|---|---|
| Variable Name | F-Value | df | significance | Partial Eta Squared |
| Pre-Post VAS | 74.991 | 1 | <.001 | .163 |
| Pre-Post VAS*Gender | 0.688 | 1 | .407 | .002 |
| Pre-Post VAS*Intervention | 0.170 | 3 | .917 | .001 |
| Pre-Post VAS*Intervention*Gender | .335 | 3 | .800 | .003 |
| Main Effects | | | | |
| Variable Name | F-Value | df | significance | Partial Eta Squared |
| Gender | 0.141 | 1 | .708 | .000 |
| Intervention | 1.251 | 3 | .291 | .010 |
| Intervention*Gender | 1.185 | 3 | .315 | .009 |

Table 8

ANCOVA for Hypothesis 5 (with covariates-Depression, Inattention, Impulsivity)

| Interactions | | | | |
|---|---|---|---|---|
| Variable Name | F-Value | df | significance | Partial Eta Squared |
| Pre-Post VAS | 113.119 | 1 | <.001 | .231 |
| Pre-Post VAS*Depression | 5.535 | 1 | .019 | .015 |
| Pre-Post VAS*Inattention | 6.319 | 1 | .012 | .017 |
| Pre-Post VAS*Impulsivity | 4.762 | 1 | .030 | .013 |
| Pre-Post VAS*Gender | 0.002 | 1 | .966 | .000 |
| Pre-Post VAS*Intervention | 0.259 | 3 | .855 | .002 |
| Pre-Post VAS*Intervention*Gender | 0.309 | 3 | .819 | .002 |
| Main Effects | | | | |
| Variable Name | F-Value | df | significance | Partial Eta Squared |
| Depression | 20.910 | 1 | <.001 | .053 |
| Inattention | 49.839 | 1 | <.001 | .117 |
| Impulsivity | 11.859 | 1 | .001 | .031 |
| Gender | 0.887 | 1 | .347 | .002 |
| Intervention | 0.287 | 3 | .835 | .002 |
| Intervention*Gender | 0.119 | 3 | .949 | .001 |

Table 9
ANCOVA for Hypothesis 6

| Interactions | | | | |
|---|---|---|---|---|
| Variable Name | F-Value | df | significance | Partial Eta Squared |
| Pre-Follow-Up VAS | 2.203 | 1 | .140 | .017 |
| Pre-Follow-Up VAS*Gender | 0.173 | 1 | .678 | .001 |
| Pre-Follow-Up VAS*Intervention | 1.960 | 3 | .123 | .043 |
| Pre-Follow-Up*Intervention*Gender | 1.636 | 3 | .184 | .036 |
| Main Effects | | | | |
| Variable Name | F-Value | df | significance | Partial Eta Squared |
| Gender | 0.117 | 1 | .733 | .001 |
| Intervention | 0.375 | 3 | .771 | .009 |
| Intervention*Gender | 0.718 | 3 | .543 | .016 |

## Logistic Regression Analyses ($H_7$)

Pathological and Non-Pathological Gamers differed significantly in a number of important ways (see Table 10). Pathological Gamers began gaming earlier, demonstrated more symptoms of ADHD and distress, greater engagement/flow, greater online gaming time, and a larger decrease in the Delayed Change in Gaming Pathology score. A logistic regression was conducted due to concerns about the disproportionate sample sizes, less-than-optimal distributions, and poor homogeneity of variance. This regression assessed the extent to which Pathological Gaming (Initial VAS > 63) classification could be predicted from the gaming-related (Hours Offline, Hours Online, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattentive, Hyperactivity, and Impulsivity) distress indicators. Data screening led to elimination of 19 outliers based on multivariate normality. Regression results (see Table 11) indicated pathological and non-pathological gaming could be optimally differentiated through the three predictors of Gaming Flow, Hours Online, and Inattentiveness, -2 Log likelihood=321.356; $\chi^2$ (9) = 215.775, $p < .001$. This model correctly predicted 86.9% of cases with greater success assigning Non-Pathological (95.6%) as opposed to Pathological (49.0%) gamers. Gaming Flow was the strongest risk factor, followed by inattentiveness and hours online.

Table 10

Differences in Critical Variables Compared between Pathological or non-Pathological Gamers

| | Pathological Gamers | | Non-Pathological Gamers | | ANOVA Results | | | Homogeneity of Variance | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | N | Mean (SD) | N | Mean (SD) | df | F-value | p-value | Levene | Sig |
| Age to begin gaming | 111 | 9.18 (28.37) | 440 | 6.38 (3.85) | 1,549 | 4.002 | .046 | 11.315 | 0.001 |
| Inattention | 107 | 20.94 (6.90) | 431 | 13.99 (4.76) | 1,536 | 150.376 | <.001 | 32.335 | <.001 |
| Hyperactivity | 108 | 10.25 (3.83) | 432 | 7.44 (2.57) | 1,538 | 83.102 | <.001 | 31.181 | <.001 |
| Impulsivity | 108 | 7.54 (3.17) | 432 | 5.50 (2.10) | 1,538 | 64.871 | <.001 | 42.268 | <.001 |
| Overall ADHD symptoms | 107 | 38.71 (12.24) | 431 | 26.92 (7.62) | 1,536 | 156.534 | <.001 | 41.253 | <.001 |
| Depression | 106 | 34.35 (12.61) | 437 | 23.62 (10.55) | 1,541 | 81.424 | <.001 | 11.527 | 0.001 |
| Anxiety | 109 | 25.10 (18.30) | 434 | 18.29 (5.51) | 1,541 | 103.548 | <.001 | 48.209 | <.001 |
| Stress Score | 108 | 31.63 (10.44) | 435 | 22.56 (7.76) | 1,541 | 101.875 | <.001 | 21.506 | <.001 |
| Total DASS Score | 105 | 91.10 (29.22) | 434 | 64.53 (21.51) | 1,537 | 110.856 | <.001 | 24.872 | <.001 |
| Gaming Flow | 112 | 62.03 (10.53) | 438 | 45.61 (10.29) | 1,548 | 224.833 | <.001 | .000 | 0.996 |
| Hours Offline | 112 | 15.72 (15.84) | 440 | 12.99 (14.14) | 1,550 | 3.182 | .075 | 1.715 | 0.191 |
| Hours Online | 112 | 29.98 (104.94) | 440 | 15.53 (16.39) | 1,550 | 7.646 | .006 | 10.551 | 0.001 |
| Total Gaming Time | 112 | 45.70 (104.23) | 440 | 28.52 (21.75) | 1,550 | 10.256 | .001 | 9.680 | 0.002 |
| Longest Gaming Session | 112 | 14.88 (9.44) | 440 | 13.76 (9.72) | 1,550 | 1.213 | 0.271 | 0.796 | 0.373 |
| Initial Pathology | 112 | 73.95 (9.77) | 440 | 45.41 (8.62) | 1,550 | 926.657 | <.001 | 1.430 | 0.232 |
| Post-Test Pathology | 81 | 68.22 (14.99) | 318 | 39.93 (10.64) | 1,397 | 380.934 | <.001 | 7.770 | 0.006 |
| Follow-up Pathology | 27 | 66.15 (10.11) | 112 | 44.21 (10.35) | 1,137 | 98.632 | <.001 | 0.891 | 0.347 |

Table 11

Regression Coefficients of Risk factors for Pathological Gamers (based on total Initial Pathology Score)

| Initial Logistic Regression with Enter Method for relevant gaming variables | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | *B* | Wald | df | sig | Odds Ratio | Lower 95% CI | Upper 95% CI |
| Hours Online Gaming | .025 | 7.582 | 1 | .006 | 1.025 | 1.007 | 1.043 |
| Hours Offline Gaming | .005 | 0.228 | 1 | .633 | 1.005 | 0.985 | 1.026 |
| Longest Session | -0.28 | 2.182 | 1 | .140 | 0.972 | 0.937 | 1.009 |
| Gaming Engagement/Flow | .133 | 63.184 | 1 | .000 | 1.143 | 1.106 | 1.181 |
| Depression | .026 | 2.148 | 1 | .143 | 1.026 | 0.991 | 1.063 |
| Anxiety | .033 | 0.944 | 1 | .331 | 1.033 | 0.967 | 1.104 |
| Inattention Score | .100 | 8.762 | 1 | .003 | 1.105 | 1.034 | 1.181 |
| Hyperactivity | -.088 | 1.672 | 1 | .196 | 0.916 | 0.802 | 1.046 |
| Impulsivity | .118 | 3.328 | 1 | .068 | 1.125 | 0.991 | 1.277 |

## Help Seeking Behavior ($H_8$)

A total of 28 of the 142 (19.7%) participants who provided follow up data acknowledged that their gaming habits were sufficiently problematic to warrant seeking one or more forms of support. Help-seeking behavior varied among those acknowledging a problem (e.g., 10 shared their concerns with a family member,13 with a friend, 3 with a mental health professional, 2 with a professional counselor, and 13 with some other resource). When considering Intervention conditions, only 3 (10.7%) of the Control (wait-period) participants and 7 (25.0%) of the Neutral Support Group participants sought help by the one month follow up. By contrast, 7 (25.0%) of the Gaming Support Group participants and 11 (39.3%) of the Diagnostic Awareness participants sought help at one month follow up.

A chi-square test of independence was performed to examine the relationship between Intervention and Help-Seeking Behavior. The percentage of participants who sought help did not differ by Intervention condition, $X^2$ (3, $N$=142) = 5.063, $p$ = .167. In addition, a logistic regression was completed to identify potential protective factors and risk factors related to Help-Seeking Behavior for problematic gaming. This regression assessed the extent to which Help-Seeking Behavior could be predicted from Intervention, Initial Pathology, gaming-related (Hours Offline, Hours Online, Longest Gaming Session, Gaming Flow) and mental health (Depression, Anxiety, Inattentive, Hyperactivity, and Impulsivity) distress indicators. Data screening led to elimination of two cases due to being multivariate outliers. Regression results (see Table 12) indicated help-seeking behavior could be optimally differentiated through the predictors of Initial Pathology and Inattention, -2 Log likelihood=99.916; $\chi^2$ (13) = 37.379, $p$ <.001. This model correctly predicted 85.0% of cases with greater success assigning failure to seek help (94.7%) as opposed to help-seeking (44.4%) gamers. Interestingly, while Intervention as a whole did not

significantly predict help seeking behavior, there was a trend between the Diagnostic Awareness Intervention and help-seeking behavior.

Table 12

Regression Coefficients of Predictive factors for Help-Seeking

| Initial Logistic Regression with Enter Method for relevant gaming variables | | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | *B* | Wald | df | sig | Odds Ratio | Lower 95% CI | Upper 95% CI |
| Hours Online Gaming | -.030 | 1.964 | 1 | .161 | .970 | .930 | 1.012 |
| Hours Offline Gaming | .005 | 0.037 | 1 | .848 | 1.005 | .957 | 1.055 |
| Longest Session | -.006 | 0.022 | 1 | .883 | .994 | .924 | 1.071 |
| Gaming Engagement/Flow | -.013 | 0.154 | 1 | .694 | .987 | .926 | 1.052 |
| Depression | .026 | 0.555 | 1 | .456 | 1.026 | .959 | 1.097 |
| Anxiety | -.085 | 1.550 | 1 | .213 | .918 | .803 | 1.050 |
| Inattention Score | .131 | 4.260 | 1 | .039 | 1.141 | 1.007 | 1.292 |
| Hyperactivity | -.056 | 0.186 | 1 | .666 | .946 | .734 | 1.218 |
| Impulsivity | .169 | 1.652 | 1 | .199 | 1.185 | .915 | 1.534 |
| Initial Pathology | .082 | 8.038 | 1 | .005 | 1.085 | 1.026 | 1.149 |
| Neutral Support Group | 1.306 | 2.268 | 1 | .132 | 3.692 | .675 | 20.205 |
| Gaming Support Group | 1.481 | 2.838 | 1 | .092 | 4.398 | .785 | 24.636 |
| Diagnostic Awareness | 1.651 | 3.556 | 1 | .059 | 5.211 | .937 | 28.979 |

# CHAPTER IV

# DISCUSSION

The overall objectives of this research were to identify pathways to helping pathological gamers identify the need for and begin to seek services to address gaming pathology. A major element of this included examining various factors related to gaming pathology, including demographic variables, gaming related variables, and mental health variables. There are a number of important topics for consideration in light of the existing literature and what this data can contribute to that research. The salient findings of this research project suggest that a sizeable portion of regular gamers can engage in help-seeking behavior with education, and the likelihood of this increases as awareness of gaming problems increases. This will be reviewed as a function of specific hypotheses and a synthesis of the overall data set.

With regard to gender differences ($H_1$), few significant differences were found; however, it is worth noting that the sample was predominantly male. Nonetheless, there was a clear difference in that males tended to have stronger positive correlations between pathological gaming and ADHD. It is somewhat surprising that more gender differences were not identified, especially in light of a preponderance of research findings suggesting males are more prone to both gaming and pathological gaming (Andreassen et al., 2016; De Grove, Courtois & Van Looy, 2015; Kapalo, Dewar, Rupp & Szalma, 2015). With that being said, some recent research has found no significant gender differences in regard to gaming habits and pathological gaming, which may reflect efforts of the gaming industry to expand markets from saturated male gamers

to be more inclusive of female gamers (Eigenfeldt-Nielsen, Smith, & Tosca, 2016; Kim et al., 2016). Thus, the current findings may support the notion that among members of the gaming community, gender differences are less pronounced. In any event, the lack of gender differences and primarily male sample allowed for some simplification of data review and analysis, rather than confounding results with strong gender interactions.

With regard to gaming related variables and mental health factors as predictors of pathological gaming ($H_2$, $H_3$, $H_4$), it appears that gaming flow is the strongest predictor of initial gaming pathology scores. This is consistent with a range of findings relating to the relevance of flow to gaming time and pathology (Adachi & Willoughby, 2012; Campbell, 2012; Kaye, 2016). On the other hand, it is interesting that flow was less significant of a predictor for post-test or follow-up measures of gaming pathology; however, this may be accounted for by the fact that measures of flow are subsumed in the measures of gaming pathology. Though less pronounced then gaming flow, there were also significant correlations between depression and pathological gaming, which fits with the numerous research findings highlighting the increased risk of gaming pathology among depressed males (Andreassen et al., 2016; Campbell, 2012; Eickhoff et al., 2015; Geissel et al., 2015; Kim et al., 2016; Weaver et al., 2009) and the implication of excessive gaming as a cause of depressive symptoms (Hellstrom et al., 2015). While not directly measured, there were many postings on reddit.com related to this research that reflected social support from fellow gamers and this may indicate the possibility that the social support provided by members of the gaming community could serve as a buffer against depressive symptoms and may warrant future research attention. It is less surprising that anxiety was minimally impactful, accounting for less than 1% of the variability in initial pathology as this is less frequently identified as being significantly correlated with gaming pathology (Kim et al., 2016; Muller et

al., 2015). Given the extensive neurobiological data and specific research regarding ADHD and gaming pathology it makes sense that ADHD symptom clusters, particularly inattention and impulsivity had significant effects (Chou et al., 2015; Dalbudak & Evren, 2014; Han, Kim & Renshaw, 2015).

With regard to the intervention ($H_5$, $H_6$), it appears that the intervention itself had little or no significant effect on gaming pathology scores. When covariates (depression, inattention, impulsivity) were included, the covariates significantly impacted pathological gaming, while the Intervention did not. This is not to say the intervention had no effect, especially when considering that nearly twenty percent of individuals at one month follow up reported engaging in some form of help-seeking behavior. It would seem that engagement in the research was pertinent to this change, which certainly does not reflect current trends, where in most gamers seeking treatment are referred by loved ones (Beranuy, Carbonell, & Griffiths, 2013). Thus, it may be that the changes brought about by engagement in the research could be attributed to others factors (such as repeated exposure to a questionnaire about gaming pathology), had a very small effect size unique to the intervention condition, and/or that there may be behavior change without insight change.

When comparing Pathological Gamers against Non-Pathological gamers ($H_7$), a number of significant differences were found, but due to statistical reasons, strict interpretation of this data is precarious while a more statistically sound comparison using logistic regression found that Gaming Flow, Inattentiveness, and Hours Online were the strongest predictive factors for classification as a Pathological gamer. These three predictors were strong enough to accurately predict non-pathological gaming classification in 19 of 20 cases, while detecting pathological gaming classification about half the time. While this discrepancy may have some intersection

with base rates and predictive processes in general, it likely suggests that lower levels of gaming flow, inattentiveness, and online gaming time predict non-pathological gaming while higher levels and some other relevant factors (not directly assessed in this research) predict gaming pathology. Given the limited scope of the current study, it is likely that other relevant risk factors, internal, external, and neurobiological in nature, could be incorporated into an even stronger predictive model and should be examined in future research (Andreassen et al., 2016). By extension, this could lead to developing a screening tool to target preventive (psychoeducation) intervention approaches for the gaming population or loved ones of gamers.

When considering help-seeking behavior at the one month follow up ($H_8$), nearly one in five gamers reported engaging in some kind of help-seeking behavior, utilizing a variety of potential resources; although there was no significant association between the intervention and help-seeking, a strong trend was found between exposure to the DSM-5 based video and actual help-seeking behavior. Given this trend, it is possible that the design of the interventions was either ineffective or had a small effect that was subsumed by the fact that participants had reviewed the VAS four times during the initial survey. Hence, it is entirely probable that this research demonstrates that increased knowledge increases awareness and help-seeking and that the knowledge can be gained many ways. It is also worth noting that help-seeking was best predicted from initial Pathology scores and Inattentiveness. More specifically, those reporting higher initial pathology scores and greater levels of inattentiveness were more likely to seek help even though inattentive symptoms are a risk factor for pathological gaming.

When synthesizing these findings, Gaming Flow was a powerful predictor of gaming pathology as has been demonstrated elsewhere (Campbell, 2012; Charlton & Danforth, 2007). The data here also suggests that ADHD symptoms are a strong predictive factor, particularly

inattention, corroborating the existing but underdeveloped literature demonstrating elements of ADHD increase the risk of excessive gaming (Chou et al., 2015; Han, Kim & Renshaw, 2015). Another critical finding is that, while the intended intervention had no significant impact on self-report of gaming pathology symptoms, it is likely that exposure to information about gaming pathology influenced awareness and eventual pursuit of support for excessive gaming. This is not a unique idea for addictive behaviors in general, (Wohl, Santesso & Harrigan, 2013) but it appears to be the first time it has been clearly demonstrated in research settings for pathological gaming.

Anecdotally, one participant directly contacted this author seeking additional resources while another publicly shared the revelatory nature of the information received, claiming that after completing the initial survey he recognized the severity of his gaming pathology and immediately sought support. It is unclear if this catalyzed further insight or behavior change for other gamers seeing the post. Another important anecdotal finding speaks to the continued use of the psychoeducational materials after completion of the survey; in the year since the data was collected, both the Diagnostic Awareness (240 views) and Gaming Support Group (246 views) videos have continued to be watched. While these videos are certainly not viral, the number of views has doubled without any efforts to intentionally disperse them after the end of the data collection process, which speaks to the potential for this approach to have lasting (low cost) benefit, especially if well designed and well implemented.

## Study Limitations

While there are important corroborative findings about the relationship between multiple variables (Gaming Flow, Depression, ADHD) and the risk of pathological gaming and significant findings regarding help-seeking behavior for pathological gaming, it is important to

also consider limitations and strengths of the current study. Methodologically, use of self-report is prone to some level of inaccuracy (Meade & Craig, 2012) although it is also the predominant form of data collection for most research regarding pathological gaming (Meredith, Hussain & Griffiths, 2009; Muller et al., 2015). In addition, the sample selected may have been skewed by selection bias, being screened directly from the gaming community and the sample itself suffered some attrition, leaving the statistical analyses open to multiple threats to validity (Mertler & Vannatta, 2005). On the other hand, the results should also be more generalizable to the specific population of interest—members of gaming communities—and provided an opportunity for gamers to communicate with one another about any concerns they have about their gaming behaviors after being exposed to the intervention.

Regarding attrition, it is likely this was (at least to a considerable extent) an artifact of sample characteristics and technical difficulties. The participants were (albeit willingly) shifting from a desired activity congruent to a personal hobby or passion to a fairly lengthy (20-30 minutes) boring (survey research) activity that could easily be perceived to challenge the value they had invested in that hobby. It is also inherently difficult to have high retention for longitudinal research, barring extensive investment and clearly established worth to the participants, and many of the gamers reported tendencies that speak to low likelihood of persisting in a non-engaging activity for any duration, let alone returning to the activity one month later. These notions are supported by the growth of research regarding self-determination theory and the weight of importance gaming has to a gamer's identity (Beard & Wickham, 2016; Burgers, 2015; Hellstrom et al., 2012). A number of participants also spoke to difficulty accessing and maintaining a connection to the survey; some also spoke to dislike for the specific formatting used and explicitly stated in private message that they discontinued for that reason.

There were also some complaints about the design of the intervention, particularly mentioning that the voices of the goanimate program fell into "uncanny valley territory"; this is a reference to the discomfort that arises when computers, robots, or artificial intelligence fail to effectively mimic human qualities (Ho & MacDorman, 2017). While it was a deliberate effort to create a memorable experience, it was not intended to be an uncomfortable or unpleasant one and it may be possible that the effect of receiving data was washed by the desire to forget the unpleasant experience. In spite of the limitations, there is considerable convergence of the current findings into the relevant extant literature and the unique findings are conceptually sound extensions of existing work (Dong & Potenza, 2016) that hadn't been extended to relate to help-seeking behavior.

Another noteworthy limitation may have been the specific gaming pathology assessment tool (VAS) utilized for this research. While this tool has been well validated, it in all reality may have been an early, underdeveloped, attempt to standardize assessment of pathological gaming. A newer version (Internet Gaming Disorder Scale) was recently created by the same authors and another expert after this research was already in motion and appears to be a superior tool (Lemmens, Valkenburg & Gentile, 2015) based on DSM-5 criteria which have growing support as an optimal framework to identify pathological gaming (Kim et al., 2016; Petry et al. 2014). While the study was designed with a self and other report version of this measure, many participants messaged that they viewed the other-report version as being erroneous and either skipped this section or were unsure how to fill it out. Thus, research naïveté on the part of the participants may have uniquely interacted with the assessment design of the research.

## Future Directions

Clearly there is a need for on-going research regarding pathological gaming and intervention and there is growing momentum in the field to do just that. Additional efforts to educate gamers about pathological gaming should be examined; while the current approach used youtube videos, there are many potential channels which can be explored to share this information, especially if the gaming industry takes a stance for responsible gaming and tolerates or even promotes (funds) research and interventions to support moderate gaming practices. Even a clunky video with poor animation and sound quality was utilized after completion of the research by at least another 100 people so it stands to reason that a well manufactured video could reach thousands or millions of gamers, especially if it goes through the right channels to connect with gamers. Many gamers have learned higher levels of technology literacy so it would be important to keep this in mind, being sure to design interventions these individuals would be more drawn to, having qualities including ease of access through internet, high auditory and/or video stimulation, "nerd/geek appeal", and a concise, but powerful, message. By contrast, lengthy, unengaging, mainstream, long-winded approaches (especially in paper format) would be less likely to have as much impact. It is also important to consider the incentive to get gamers to be open to such information, at it may compete with time and motivation heavily committed to gaming activities and identity.

It will also be critical to develop longitudinal studies with wider time windows to assess long-term outcomes of help-seeking behavior. Given the interaction between gaming pathology and ADHD, it will also be important to examine how efforts to manage ADHD symptoms impact treatment success or failure for pathological gaming and long-term outcomes in that regard. As the preponderance of data for pathological gaming comes from online, self-report studies

(Meredith, Hussain & Griffiths, 2009; Muller et al., 2015) it could be useful to consider alternative avenues to data collection. For instance, given the gradual neurobiological changes, especially to the visual processing systems (Han et al., 2015), it might be possible to develop an eye movement tracking application that could be downloaded by gamers or their loved ones to monitor gaming activities and even standardized to distinguish different classifications of gamers (i.e. novice, veteran, pathological, etc.), although this might be a monumental and expensive effort. More practically speaking, it might also be important to examine gaming related beliefs, behaviors, and consequences comparing gamer-report to other-report (parent, spouse, etc.). In a similar vein, there may be considerable benefit to exploring perceptions of gaming pathology and efforts to address this within the gaming community; it is entirely possible that gamers will be resistant to concerns about pathological gaming if they come from those outside of the community, especially if it threatens their self-concept and self-worth (Beard & Wickham, 2016).

In conclusion, the current research corroborates the intersection of pathological gaming with various factors of the gaming experience and mental health indicators, particularly depression and inattention, while demonstrating that increasing knowledge of pathological gaming likely increases help-seeking behaviors among members of the gaming community. These findings warrant on-going research in this area and highlight the importance of tracking trajectories of pathological gaming over the long-term and identifying effective means of encouraging pathological gamers to seek, complete, and benefit from treatment, while showing some promise that a crucial first step in this process relates to increased psychoeducation to the gaming community.

# APPENDICES

Appendix A
Neutral Support Group Condition
https://www.youtube.com/watch?v=zWyzLL99DZI&feature=em-upload_owner

SAM

Sam is a 19-year-old sophomore who is failing classes and cannot keep up with course work. Sam comes to the group after getting sanctioned by the University.

"Ummm.. so I don't really know what to do here. It sounds like we are supposed to talk about our problems. I'd rather talk about the school's problem because I don't think weed is keeping me from succeeding which seems to be what the University thinks. Anyway, they said that since I smoke weed every day and don't show up to more than half my classes they will kick me out unless things change big time. I guess I'm here to make them leave me alone. I can try to do better in school and maybe I'll wait until after classes to smoke. I'm not sure I really want to stay here though so I guess we'll just wait and see."

RAJ

Raj is a 17 year old international student from India who has always been pressured to succeed. His advisor learned of his use of unprescribed Adderall and informed him of the potential consequences including deportation.

"I just found out that my use of Adderall could get me kicked out. My family would quite literally kill me if they found out about it so I am doing what my advisor said and coming to this group so I can stop using. I know it's not good for me but I use it to help me keep up with my studies. All of my older siblings have already earned doctoral degrees and I am only a sophomore but it is so hard to keep up with all the pressure. The Adderall is the only thing that helps me stay up and study all night and be able to focus on my work. I don't know how I would

get through school without it so I need some help figuring out how to succeed without the drugs."

NANCY

Nancy is a 32-year-old nursing student who recently returned to school to complete her degree. She has gained fifty pounds since coming back to school five months ago.

"Nobody takes me seriously when I say this but I think I'm a chocoholic. I've been eating chocolate all my life. Now that I'm back in school and super stressed out I eat even more and just can't stop myself. I have to have chocolate with all my meals and am constantly snacking on chocolate. I eat as many as five jumbo sized bags of assorted chocolates each week. Last night my husband found me up eating a twelve pack of chocolate pudding last night and freaked so I told him I would try and get some help. I eat the most when I'm stressed and school has been so hard this year. None of my clothes fit me anymore and I hate my body. I even try to throw up after I eat too much chocolate but then I just eat more anyway. I need someone to help me get control and I just don't know how to do it by myself."

Appendix B
Gaming Support Group Condition
https://www.youtube.com/watch?v=Xcz6Y8reVs0

HARRY

Harry is a 26-year-old who has struggled with alcohol use since high school. He has not been able to keep a steady job and has tried multiple times to compete his college degree but has not yet succeeded.

"So my girlfriend told me I have to come here because I have an alcohol problem. I'm not sure I see it the same way she does. She says I don't have a life unless I am drinking and that I am no fun to be around unless I have alcohol in my system. She also said that lately I'm not fun to be around even when I am drinking. I guess that might be true. Mostly I just want to have fewer hangovers and make sure I don't get any more DUI's or I'll have jail time. Since she really wants me to change and said she would break up with me if I don't, I decided I would come here and give this a shot."

HILLARY

Hillary is a 22-year-old education major who plans to graduate at the end of the semester. She is worried because she has over 100,000 dollars in credit card debt on top of student loans and doesn't know how she is going to pay it off.

"For me personally, my biggest problem is saying no at the store. I am constantly buying new shoes, clothes, tablets, and just about anything that looks flashy and trendy. I don't even use half the stuff and I have boxes of things that I only used once. The electronics are really bad because sometimes I buy it and can't figure out how to use it so I just hide it. It's so embarrassing having to hide all this stuff from my roommate and my boyfriend said he was going to leave me if I don't get it under control. Its just so stressful dealing with all the bills and

when I get stressed I get on Amazon and rack up even more bills. I just don't see how to end it and I am never going to have a future if I can't turn things around."

ALEX

Alex is a 24 year old junior majoring in computer science and psychology. He can't keep up with his homework because he plays video games instead and can only keep a part-time course load to find time to game.

"At first I didn't think this group was right for me but it seems like I can relate to a lot of your problems. I have been playing video games since I was five but it didn't become a problem until I got into college. As soon as I got away from my parents I was playing all day long and almost flunked out of my first semester. I tried harder after that but I have never been able to keep my gaming to less than 8 hours a day. I usually stay up too late cause I can't stop; I tell myself I'll stop at 1AM , then I keep adding five more minutes until its sunrise. My gamer buddies online say its not big deal because they all do it too but over the break my parents said they were getting really worried. My roommate found me passed out on my computer when he got home from class last week and said I needed to get some help. The games are my help cause I'm so lonely and can't figure out how to make friends in person. Maybe coming here can help me change some things."

Appendix C
Diagnostic Video
https://www.youtube.com/watch?v=tabpMcPcKQ0

Narrator with strong British accent:

Many people do not realize that there is such a thing as video game addiction. In fact, many video game addicts do not even realize that this exists or that they are struggling with it. However there is growing research to indicate that it exists and many researchers are now considering diagnostic criteria for this disorder. Consider each of the following aspects of video game addiction and how well they relate to your life and experiences.

Do you find yourself preoccupied with video games? Many video game addicts find video games to be the important aspect of their lives and everything else revolves around the games they play.

Do you find yourself being in withdrawal when you can't play video games? Many video game addicts report having withdrawal symptoms, such as irritability, anxiety, or sadness when they are deprived of their games or when they try to quit playing so much.

Do you need increasing amounts of time for video games? Many video game addicts spend progressively more time gaming, starting with lower amounts like 15 or 20 hours per week then gradually escalating to as many as 40, 50, or even 100 hours a week in extreme cases.

Have you been unable to control how much you play video games? Many video game addicts find themselves unable to stop playing and usually don't realize just how much video games have taken over their lives.

Are video games the only activity you enjoy or pursue anymore? Many video games addicts will become so engrossed in their games that they will abandon other previously enjoyable activities, like sports, socializing, or exercise to spend more time gaming.

Do you continue to play video games even though you recognize it creates problems in your life? Many video game addicts will continue gaming even if they are aware if has a severe negative impact on their lives.

Do you lie to family, friends, or other important people in your life about your gaming habits? Many video game addicts will deceive their loved ones and those who care for them about just how bad their video game habit is.

Do you use video games to escape from reality or feel better when you are stressed out or bored? Many video game addicts play video games because they help them cope with stress, anxiety, boredom, or other negative moods even though it doesn't fix the problems causing these mood states.

Has your video game play caused significant losses in your job, school, friendships, romantic relationships or with family? Many video game addicts will play so excessively that they ignore their obligations in life, disrupting their school, work, or even ruining critical relationships with family, friends, or loved ones.

If you identify with any of those questions you may want to consider whether or not you could struggle with excessive gaming. If you identify with five or those questions for a continual time of one year or longer, you are likely to have a video game addiction. If you are concerned about your gaming habits and how they could be impacting your life, now is the time to do something about it and try to make changes and get help and support in making those changes.

Appendix D
Demographics Questionnaire

What is your age? _____

What is your gender? _____

How would you describe your employment status? (select all that apply)

| | |
|---|---|
| Unemployed | Retired |
| Part-Time Employee | Full-Time Employee |
| Part-Time Student | Full-Time Student |
| Other_____ | |

How would you describe your relationship status?

| | | |
|---|---|---|
| Single | | Serious dating or committed relationship |
| Civil Union, Domestic Partnership or Equivalent | | |
| Married | Separated | Divorced |
| Widowed | Other_____ | |

How would you describe your sexual orientation?

| | | |
|---|---|---|
| Heterosexual | Lesbian | Gay |
| Bisexual | Questioning | Other_____ |
| Prefer not to answer | | |

How would you describe your racial/ethnic identify? (select all that apply)

| | |
|---|---|
| African American/Black | American Indian or Alaskan Native |
| Asian American/Asian | Caucasian/White |
| Hispanic/Latino(a) | Native Hawaiian or Pacific Islander |
| Multi-Racial_____ | Other_____ |

Appendix E
Video Game History Questionnaire

At what age did you first begin playing video games? _____
How many video games do you have access to in your current residence? _____

How many gaming systems do you have access to in your current residence? _____

How much money do you spend on video games per year? _____

When growing up, did you have the ability to play video games in your bedroom?

If yes then:

How old were you when you first began playing video games in your bedroom?

Approximately how many games have you played in the past six months?

Approximately how many hours per week do you play video games online?

Approximately how many hours per week do you play video games offline?

What is the longest amount of time you have ever played a game in one sitting?

Appendix F
Game Engagement Questionnaire

Consider your gaming experiences for the past six months. On a scale of 1-5 (1=never, 2 =rarely, 3=sometimes, 4=often 5= very often) indicate how often the following statements apply to you.

I lose track of time.

Things seem to happen automatically.

I feel different.

I feel scared.

The game feels real.

If someone talks to me, I don't hear them.

I get wound up.

Time seems to kind of stand still or stop.

I feel spaced out.

I don't answer when someone talks to me.

I can't tell that I'm getting tired.

Playing seems automatic.

My thoughts go fast.

I lose track of where I am.

I play without thinking about how to play.

Playing makes me feel calm.

I play longer than I meant to.

I really get into the game.

I feel like I just can't stop playing

Appendix G
Video Game Addiction Scale

Consider your gaming experiences for the past six months. On a scale of 1-5 (1=never, 2 =rarely, 3=sometimes, 4=often 5= very often) how often during the last six months:

Did you think about playing a game all day long?

Did you spend much free time on games?

Have you felt addicted to a game?

Did you play longer than intended?

Did you spend increasing amounts of time on games?

Were you unable to stop once you started playing?

Did you play games to forget about real life?

Have you played games to release stress?

Have you played games to feel better?

Were you unable to reduce your game time?

Have other unsuccessfully tried to reduce your game time?

Have you failed when trying to reduce game time?

Have you felt bad when you were unable to play?

Have you become angry when unable to play?

Have you become stressed when unable to play?

Did you have fights with others (e.g. family, friends) over time spent on games?

Have you neglected others (e.g. family, friends) because you were playing games?

Have you lied about time spent on games?

Has your time on games caused sleep deprivation?

Have you neglected other important activities?

Did you feel bad after playing for a long time?

For the other report form, the survey was introduced with the statement:

Think about the person who you consider to be the most involved in video games. Consider that person's gaming experience for the past six months, to the best of your knowledge. How often during the last six months…

the word you was replaced with the "the person you are thinking of"

Appendix H
DASS

Please read each statement and circle a number 0, 1, 2 or 3 that indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

0 Did not apply to me at all

1 Applied to me to some degree, or some of the time

2 Applied to me to a considerable degree, or a good part of time

3 Applied to me very much, or most of the time

I found myself getting upset by quite trivial things

I was aware of dryness of my mouth

I couldn't seem to experience any positive feeling at all

I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)

I just couldn't seem to get going

I tended to over-react to situations

I had a feeling of shakiness (eg, legs going to give way)

I found it difficult to relax

I found myself in situations that made me so anxious I was most relieved when they ended

I felt that I had nothing to look forward to

I found myself getting upset rather easily

I felt that I was using a lot of nervous energy

I felt sad and depressed

I found myself getting impatient when I was delayed in any way (eg, elevators, traffic lights, being kept waiting)

I had a feeling of faintness

I felt that I had lost interest in just about everything

I felt I wasn't worth much as a person

I felt that I was rather touchy

I perspired noticeably (eg, hands sweaty) in the absence of high temperatures or physical exertion

I felt scared without any good reason

I felt that life wasn't worthwhile

I found it hard to wind down

I had difficulty in swallowing

I couldn't seem to get any enjoyment out of the things I did

I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)

I felt down-hearted and blue

I found that I was very irritable

I felt I was close to panic

I found it hard to calm down after something upset me

I feared that I would be "thrown" by some trivial but unfamiliar task

I was unable to become enthusiastic about anything

I found it difficult to tolerate interruptions to what I was doing

I was in a state of nervous tension

I felt I was pretty worthless

I was intolerant of anything that kept me from getting on with what I was doing

I felt terrified

I could see nothing in the future to be hopeful about

I felt that life was meaningless

I found myself getting agitated

I was worried about situations in which I might panic and make a fool of myself

I experienced trembling (eg, in the hands)

I found it difficult to work up the initiative to do things

## Appendix I
## Barkley Adult ADHD Rating Scale-IV (BAARS-IV)

Please indicate how true each of the following statements feels for you during the past six months, ranging from never or rarely true to very often true.

Fail to give close attention to details or make careless mistakes in my work or other activities.

Difficulty sustaining my attention in tasks or fun activities.

Don't listen when spoken to directly.

Don't follow through on instructions and fail to finish work or chores.

Have difficulty organizing tasks and activities.

Avoid, dislike, or am reluctant to engage in tasks that require sustained mental effort.

Lose things necessary for tasks or activities.

Easily distracted by extraneous stimuli or irrelevant thoughts.

Forgetful in daily activities.

Fidget with hands or feet or squirm in seat.

Leave my seat in classrooms or in other situations in which remaining seated is expected.

Shift around excessively or feel restless or hemmed in.

Have difficulty engaging in leisure activities quietly (feel uncomfortable or am too loud or noisy).

I am "on the go" or act as if "driven by a motor" (or I feel like I have to be busy or always doing something).

Talk excessively (in social situations).

Blurt out answers before questions have been completed, complete others' sentences, or jump the gun.

Have difficulty awaiting my turn.

Interrupt or intrude on others (butt into conversations or activities without permission or take over what others are doing.

Prone to daydreaming when I should be concentrating on something or working.

Have trouble staying alert or awake in boring situations.

Easily confused.

Easily bored.

Spacey or "in a fog".

Lethargic, more tired than others.

Underactive or have less energy than others.

Slow moving.

I don't seem to process information as quickly or as accurately as others.

Did you experience any of the above 27 symptoms "often" or "very often"?

If so, how old were you when those symptoms began?_____

If so, in which of these areas did those symptoms impair your functioning?

School Home Work Social Relationships

Appendix J
Follow-Up Survey Format and Questions

Informed Consent

VAS (Self)

VAS (Other)

Since you initially participated in this study, have you at any point felt that your gaming habits are excessive or problematic?

Yes No

If you have felt your gaming habits are excessive or problematic have you done any of the following activities to address these habits?

Shared your concerns with family

Shared your concerns with friends

Shared your concerns with a mental health or addiction professional

Sought counseling or addiction services

Other _____

If you have used any of the above choices, please describe this process below. You may share as much or as little information about this as you are comfortable with sharing.

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