# MEDIATING FACTORS IN THE RELATIONSHIP BETWEEN VIDEO GAMES AND MENTAL HEALTH

KELLI N. DUNLAP

James E. Sexton, Ph.D., Ph.D.
Chair

Jennifer McEwan, Ph.D.
Second Reader

A Clinical Research Project submitted to the Faculty of the American School of Professional Psychology of Argosy University, Washington, DC, in partial fulfillment of the requirements for the degree of Doctor of Psychology in Clinical Psychology.



Arlington, Virginia
August 2014

ABSTRACT

As video games have become part of mainstream American culture, interest in the relationship between gaming and mental health has become an important area of research. Previous research on this topic has produced a wide range of results on the harm or helping consequences of playing video games. However, contemporary research has been discovering the interaction between video games and mental health is a much more complex relationship than previously hypothesized. This study seeks to further understand the dynamic connection between video game play and mental health. This study utilized online recruitment and measurement tools to obtain demographic information, video game playing habits, and mental health indicators from participants on three different video game online forums. Participants completed a set of questionnaires and registered for the online client Raptr which tracked their time spent playing video games. After 30 days, participants were re-administered the questionnaires. Results found no correlation between mental health and time spent playing video games. Data indicated participants' motivation for playing video games was predictive of some mental health symptoms. Furthermore, the results demonstrated participants were frequently inaccurate when estimating actual gaming time. This result was especially elevated in individuals with depressive symptoms and trait aggression. It is recommended that researchers be mindful regarding the inaccuracy of self-reported time spent playing video games and participant motivation for gaming when constructing future studies.

DEDICATION

To my husband Jon, and to Ellie, River, and Simon, for their love and support throughout this endeavor.

To my friends and family who always believed in me, even when I might not have believed in myself.

To all the gamers who inspired and participated in this research.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to CRP chair Dr. Sexton and second reader Dr. Jennifer McEwan for believing in and supporting this research topic. The deepest appreciation is further offered to the GrifballHub, PMS Clan, and Rooster Teeth communities for their participation in this research study. Without their contributions, this study would not have been possible.

TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

Figure Page

## Introduction

Over 50% of American households own a video game console and 58% of Americans report regularly playing video games (Entertainment, 2013). In 2012 alone, consumers spent over $20 billion dollars on video games, hardware, and accessories (Entertainment, 2013), a dramatic increase from the $6 billion total from only 13 years ago (Entertainment, 2010). The industry is supported and driven by "gamers," people who play computer and console video games. According to the Entertainment Software Association (2010), the average gamer is 34-years-old, - while 26% of gamers are over the age of 50, - and 40% of gamers are women. Women 18 years and older comprise 33% of the gaming population while adolescent males 17 years old or younger comprise only 20% (Entertainment, 2010). As video games become an increasingly popular recreational activity, much interest has been generated in the effects these games have mental health.

## Video Games and Mental Health

### Video Games, Depression, and Anxiety

Research into video games' impact on depression and anxiety is a nascent area of study producing a wide range of results. Some studies have found a positive relationship between "pathological" video game play and severity of depressive symptoms in children and adolescents (Messias, Castro, Saini, Usman, & Peoples, 2011; Gentile, Choo, Liau, Sim, Li, Fung, &Khoo, 2011; Starcevic, Berle, Porter, & Fenech, 2011). Mentzoni, Brunborg, Molde, Myrseth, Skouveroe, Hetland, &Pallensen (2010) reported 4.1% of their national sample (n=816) had 'problems with gaming' and 0.6% met their cutoff for

gaming addiction. It was reported individuals with problem gaming behavior had greater amounts of anxiety, depression, and lower levels of life satisfaction compared to non-gamers or non-problem gamers. However, the authors noted the amount of anxiety, depression, and life satisfaction reported by problem gamers was still in normal range. Furthermore, the authors reported no significant relationship between video game play and reported physical exercise. Based upon these findings, the authors indicated playing video games did not negatively impact participants' engagement in physical exercise.

Some studies have found video games had no impact, positive or negative, on depression and anxiety (Cooper, 2013; Tseng & Hsieh, 2013), but others have found video games to be an efficacious treatment (Russoniello, Fish, O'Brien, 2013; Ferguson & Rueda, 2010) across a variety of age demographics. For example, the use of exercise video games, such as Wii Fit and Wii Sports, have been found to decrease subsyndromal depression and increase quality of life and cognitive functioning in the elderly (Rosenberg, Depp, Vahia, Reichstadt, Palmer, Kerr, Norman, &Jeste, 2010). A study by Russoniello, Fish, and O'Brien (2013) found casual video games, such as *Peggle* and *Bejeweled*, to be an effective treatment for clinical depression in participants ages 18 to 56.

Another way in which video games may influence mental health is in designing games. *Neverending Nightmare* is a psychological horror game created by Matt Gilgenbach, a young man who has struggled with major depressive disorder and obsessive compulsive disorder much of his life. The game was designed as a digital manifestation of depression and obsessive compulsive disorder. The environment is

almost entirely black and white and populated with haunting images which are sometimes real, sometimes not. Although there are tools within the environment, such as a candle to help clear the haze, there are monsters which cannot be fought, only escaped. Depressive and obsessive-compulsive symptoms such as intrusive thoughts are also present in the form of bloody writing on the wall. At times, the gameplay itself elicits within the player feelings of anxiety, frustration, confusion, and even hopelessness. While the game was not designed with therapeutic interventions in mind, creating this game was a corrective emotional experience for its creator and served as a shared touchstone experience for thousands of gamers who themselves have struggled with mental illness (M. Gilgenbach, personal communication, April 13, 2014).

The impact of video games on depression in vulnerable populations has also been researched. Ferguson and Olson (2013) recruited 377 children with a mean age of 13, to test whether psychological vulnerability such as depression or impulsivity would correlate with delinquency and bullying behaviors after playing violent video games. Participants included 184 children with clinical levels of attention deficit disorder and 284 children with clinically elevated depressive symptoms. Results indicated exposure to violent video games was not correlated with bullying or delinquency behaviors in children with clinical levels of ADHD and depression. Furthermore, the only factor associated with significant levels of bullying and delinquent behaviors was trait aggression.

**Video Games and Stress**

Stress is significantly linked to mental health. It is especially intertwined with depression and can create or exacerbate medical conditions which contribute to depressive and anxious symptoms. (Russoniello, O'Brien, && Parks, 2009). Reinecke (2009) surveyed 1,614 participants regarding their use of video games as a tool for recovering from work-related fatigue and daily hassles. Results from his study indicated individuals who experience higher levels of work fatigue and daily hassles were more likely to engage in video games as a stress recovery technique when compared to those who were less stressed. The author noted, however, that general gaming - gaming not for the purpose of relaxation or recovery - was negatively correlated with work-related stress. Therefore, the author suggested the use of video games to be an individualized self-regulating experience. While general gaming appeared to be impaired by heightened levels of stress, gaming with the goal of stress reduction increased in response to higher stress levels. Based upon this finding, motivation for playing video games can influence the impact the game has on a person's stress, and consequently, their mood.

Russoniello, O'Brien, and Parks (2009) examined whether casual video games would be effective at lowering physiological stress and improving mood. The authors recruited 134 participants who were randomly assigned to either the control or experimental group. In the experimental group, participants selected one of three casual video games to play: *Bejeweled 2*, *Bookworm Adventures*, or *Peggle*. Participants in the control group were asked to browse the internet for health-related articles. All participants completed the Profile of Moods States (POMS) and were physiologically monitored by an Electroencephalogram (EEG) and a Heart Rate Variability (HRV)

measure. Participants in both conditions engaged in their assigned task uninterrupted for 20 minutes. Results revealed a significant boost in mood for participants in the experimental group regardless of what game they played. EEGs of the experimental group found changes in brain patterns consistent with improved mood although each game produced a different EEG profile. Participants who played *Bejeweled 2* experienced a decrease in brain waves associated with withdrawal and depressive behaviors. Participants who played *Bookworm Adventures* showed stabilization in brain waves between both hemispheres of the brain. Participants who played *Peggle* exhibited a change in brain activity associated with increased levels of euphoria and excitement and experienced significant decreases in physiological stress.

Video games have also been used to assist individuals either at a heightened risk of developing or currently coping with traumatic stress. A study conducted by the Mental Health Advisory Team of the United States Army (2009) consisting of 1,000 active duty soldiers in Afghanistan found playing video games three to four hours a day, or 21 – 28 hours a week, demonstrated a significant increase in mental resilience. Research with U.S. military has found that soldiers who play shooter- or war-type video games while deployed in combat zones were less likely to develop posttraumatic stress disorder (PTSD). In addition, researchers are currently exploring the use of virtual reality games to help treat returning soldiers suffering from PTSD (Rizzo et al., 2011). Furthermore, soldiers often report struggling with boredom while deployed and video games serve as an effective distraction from anxious and distressing thoughts leading up to a deployment or following a firefight (Sarr, 2014).

**Video Games and Aggression**

Much of the research on mental health and video games has sought to discover whether exposure to violent video games facilitates violent, antisocial, and aggressive behaviors (Anderson & Bushman, 2001; Anderson & Dill, 2000; Sheese & Graziano, 2005; Becker-Olsen &Norberg, 2010). Anderson and Dill (2000) conducted a meta-analysis of violent video game research through 2000 and found a positive correlation between exposure to high video game violence and heightened aggression, aggressive cognition and affect, and physiological arousal. They also found a negative correlation between violent video game exposure and pro-social behavior.

A study by Porter, Starcevic, Berle, and Fenech (2010) attempted to identify individuals with problem video game usage. Out of 1,945 participants, 156 (8%) were identified as having a problem with gaming. Examination of the data showed that problem gamers played for longer periods of time, played when they did not want to play, had fewer friends than individuals who did not have a gaming problem, and consumed excessive amounts of caffeine.

Conversely, Ferguson (2007) conducted a meta-analytical review of 17 violent video game studies and found only a 2% overlap in variance between violent video games and aggressive behavior. He also identified a significant bias in the publishing of articles that reported significant negative effects of violent video game exposure. Additionally, Ferguson, Rueda, Cruz, Ferguson, Fritz, and Smith (2008) replicated a study by Anderson and Dill (2000) in which the results indicated exposure to violent games increased aggressive behavior in participants but were unable to replicate the

result. Specifically, Ferguson et. al. (2008) stated the difference in the two results was due to statistical inaccuracies in the Anderson and Dill study, such as the interpretation of scores which had confidence intervals that included zero. Furthermore, when physical abuse was controlled within the subjects, violent video game exposure no longer predicted aggressive behavior.

There is an emerging body of literature indicating the effects of video games are a more complex issue than previously acknowledged. Markey and Markey (2010) proposed personality mitigates whether or not someone may be negatively impacted by exposure to violent video games. They hypothesized individuals with higher levels of psychoticism (i.e., emotionally cold, lacking sympathy, untrustworthy, unfriendly, antisocial) are more vulnerable to the negative effects of video games. Utilizing the Five Factor Model, they found individuals who experienced the most adverse effects from exposure to violent video games tended to score high on neuroticism, and low on agreeableness and conscientiousness. The hypothesis that personality is a factor in determining vulnerability to negative effects of violent video games is also supported by Ferguson et al. (2008) and Chory and Goodboy (2011).

Adachi & Willoughby (2011) conducted two pilot studies assessing whether competition, rather than violence, in video games would influence aggressive behavior. In the first study, participants played either a violent or non-violent video game. These games were equivalent in terms of difficulty, pace of action, and competitiveness. After playing, both groups were assessed for aggressive behavior. Results found no significant difference in aggression levels between groups, indicating violence alone was not a

sufficient enough variable to impact aggressive behavior. In the second study, participants again played one of two video games. This time, the games varied in level of competitiveness but were equivalent in terms of difficulty, pace of action, and violence. Results found higher levels of competition correlated with higher levels of aggressive behavior regardless of the amount of violence. The authors concluded that competition, not violence, was the prevalent characteristic responsible for raising levels of aggression.

Similarly, Jerabeck and Ferguson (2013) examined whether cooperation in violent video games had an impact on aggression and prosocial behavior. The authors recruited 100 students from an American university and collected data pertaining to demographics, attitudes, and perceptions about video games, aggressive behavior, cooperative behavior, and self-perceived empathy. Participants were paired and randomly assigned to play cooperatively with their partner (e.g. side by side and sharing the same television) or to play separately (e.g. in the same room but apart from one another) for 45 minutes. Participant pairs were also randomly assigned either a violent solo game, a violent cooperative game, or a non-violent game. Results indicated when participants played cooperatively their aggression decreased across all three game types. Aggression and prosocial behavior in the violent solo condition were non-significant. Based upon the results of the study, the authors surmised the context in which a video game is played is more important than the content of the video game in predicting behavioral outcomes.

Another possible influence on aggression is competence. Przybylski, Deci, Rigby, and Ryan (2013) examined the relationship between competence and aggressive thoughts, feelings, and behaviors after playing a video game. The authors conducted a

series of studies to manipulate competence and utilize a variety of different measures to assess for aggression. The studies found player competence was directly correlated with motivation to play which, in turn, was inversely correlated with aggression. This effect was prevalent regardless of whether or not violence was present in the game. In short, the more competent a player felt, the more he wanted to play and the less aggression he reported.

**Video Games and Socialization**

It is commonly believed that individuals who play video games lack social skills and have few friends. However, over 70% of gamers report playing most often with friends in-person or online (Entertainment, 2012). Furthermore, 16% of gamers report playing video games with their parents, 32% with other family members, and 16% with a spouse or significant other (Entertainment, 2013). Games can also strengthen social connections at the family level. Daughters who played video games with their parents expressed greater parent-child connectedness and pro-social behaviors as well as lower levels of internalization and aggressive behavior (Coyne, Padilla-Walker, Stockdale, & Day, 2010). Whitbourne, Ellenberg, and Akimoto (2013) surveyed 10,308 adults ranging in age from 18 to 80 years and all respondents endorsed playing video games with friends as a reason why they played. Research by Reinecke (2009) examined the use of video games as recovery tools from stress and strain and suggested individuals under moderate stress and strain use video games as a means of obtaining social support.

A landmark study in the United Kingdom tracked 11,000 children over two years, from age 5 to 7 years, to examine if exposure to video games could predict psychosocial

adjustment (Parkes, Sweeting, Wight, & Henderson, 2012). The researchers collected data on how many hours a day a child spent playing video games via parent report. Participants' parents also reported on their child's behaviors, including conduct or emotional problems, issues with peer relationships, hyperactivity/inattention, and prosocial behaviors. This information was collected again at age 7 years and compared against data collected at age 5 years. Results indicated playing video games at 5 years old was not associated with an increased risk of psychosocial problems at 7 years old.

Video games bring people together and actively fulfill basic human needs for social connectivity and collaboration (McGonigal, 2011). Similar pro-social influences can be found at the macro level as well. *Foldit* is an online puzzle game with over 236,000 users, created by the University of Washington's Center for Game Science. where players fold protein structures using the in-game tools (FoldIt, 2013). In 2011, Foldit scientists gave players three weeks to solve an AIDS retroviral protein model which had remained unsolved for 15 years; the gamers solved the protein model in 10 days (Khatib et al., 2011). In addition, gamers often attend large social gatherings as a means to socially interact with others who have similar interests. For example, the Penny Arcade Expo (PAX) is a bi-annual convention dedicated to video games. Each PAX event can accommodate approximately 60,000 people and tickets for these events sell out within minutes.

**Video Games and Motivation**

A common symptom in many mental health disorders is an unwillingness to engage in thinking, feeling, or behaving in ways which seem challenging. Clinicians can

often find it difficult to motivate a depressed individual to engage in pleasurable activities, or an anxious client to confront the anxiety-producing stimuli.

Gaming environments, however, foster a motivational style that is persistent and optimistic in the face of failure and challenge (Granic, Lobel, &Engles, 2013). Video games are adept at creating what Zygotsky (1978) described as a zone of proximal development – a balance between failure, frustration, challenge, and success which generates a motivational "sweet spot" (Granic, Lobel, &Engles, 2013). A study by Ventura, Shute & Zhao (2013) found individuals who played video games frequently demonstrated greater levels of motivation and persistence when confronted with continuously more challenging tasks compared to those who played video games infrequently.

## Games for Health

### Games for Physical Health

With the release of kinesthetic gaming consoles like the Wii in 2006 and the Xbox 360 peripheral Kinect in 2010, the future of video games looks to be more physically interactive. A study by Sohnsmeyer, Gilbrich, and Weisser (2010) found that using Wii Sports, the bowling mini-game in particular, increased isometric muscle strength of elderly subjects when compared to a control group. Warburton, Bredin, Horita, Zbogar, Scott, Esch, and Rhodes (2007) found that individuals whose exercise program included an interactive video game aspect demonstrated greater physical health improvement than participants whose exercise program did not include an interactive gaming element. The

authors stated that participants in the experimental group had higher attendance rates and therefore expended greater amounts of physical activity, resulting in better health. Foley and Maddison (2010) explored the problem of pediatric obesity and whether active video games could increase physical activity in children. The results indicated the amount of energy expended playing active video games was comparable with mild to moderate physical exercise.

Not only are physicians using existing games to help their patients, some are even developing games to help their specific cause. *Re-Mission* is a video game by HopeLabs where players guide the main character Roxxi, a human-looking nanobot, on challenging missions throughout the human body with the objective of destroying malignant cancer cells (HopeLab, 2006). A study by Kato, Cole, Bradlyn, and Polluck (2008) found children and adolescents who played *Re-Mission* experienced an increase in adherence to their medication and greater amounts of self-efficacy. This was likely due to having developed a sense of mastery over the disease by defeating it in the game.

**Games for Mental Health**

Some psychologists have been investigating the psychological and therapeutic benefits of games. For example, a study by Russoniello, Fish, O'Brien, Pougatchev, and Zirnov (2011) found playing casual video games, which are games that do not require special skills to play and feature simplistic rules and goals, were effective in lessening levels of mild to severe depression. Participants who were randomly assigned to the experimental group were asked to play a casual video game for 30 minutes while being physiologically monitored and asked to play a casual game for 30 minutes three times a

week for one month. The control group was also physiologically monitored, but instead of playing a casual video game, control participants browsed the National Institute of Mental Health's website on depression for 30 minutes. Pre-study data did not indicate any significant differences between the control group and experimental group in number of depressed participants or in severity of depression. Post-study data, however, demonstrated significant reductions in levels of depression in the experimental group. All participants who had been categorized as moderately to severely depressed at the pre-study assessment had dropped to mild or moderate status, and five of the nine participants who had been categorized as mildly depressed at pre-test no longer met the criteria for depression. Participants in the experimental group also experienced decreases in both state and trait anxiety, as well as tension, anger, fatigue and confusion, and an increase in vigor as assessed by the Profile of Mood States.

Video games are also beginning to be integrated into psychotherapy. Therapists who sit down and play a video game with a child may find it easier to establish a therapeutic relationship because the video game itself acts a medium for interaction, much like how therapists use board games in play therapy (Ceranoglu, 2010). At the Department of Child and Adolescent Psychiatry of Zürich University, researchers have created a video game that serves as an electronic way to complete Cognitive Behavioral Therapy (CBT) homework (Brezinka, 2008). The game is called *Treasure Hunt* and is comprised of six levels, each level pertaining to a specific step in CBT treatment. Studies regarding the effectiveness of the game will begin as soon as the final version of the game is completed. Another example of video games in therapy is *Earthquake in*

*Zipland*, a therapy game to help children cope with the effects of divorced parents (Zipland, 2004). The game presents common themes and feelings that children experience during and after divorce by paralleling them in a fictitious action-adventure world, and helping them to understand and express those experiences.

SPARX is an interactive role-playing video game created to address low mood, depression, anxiety, and stress in adolescents and adults (LinkedWellness, 2013). It utilizes the engaging and fun environment of a game to teach cognitive-behavioral therapy techniques. SPARX features seven levels which address seven different core areas of core CBT skills. Level one introduces players to CBT and provides psychoeducation about depression and relaxation techniques. Level two provides activity scheduling and behavioral activation paired with interpersonal skills. Level three deals with strong emotions. Level four focuses on problem solving skills and introduces cognitive restructuring. Levels five and six further develop cognitive restructuring skills. Level seven reviews the previous levels and addresses relapse prevention and an introduction to mindfulness. SPARX has been empirically studied. In a randomized clinical trial, adolescents with mild to moderate depression demonstrated a 46% remission rate. This result was significantly greater when compared to the 26% remission rate achieved by participants receiving only face-to-face therapy (Merry, Stasiak, Shepherd, Frampton, Fleming, &Lucassen, 2012).

**Biofeedback Games**

Fernandez-Arandaet. al. (2012) created *The Island*, a video game designed to assist individuals with impulsive disorders remediate attitudinal, emotional, and

behavioral processes. They recruited 24 participants who met inclusion criteria for an impulsive disorder and compared them to 14 healthy control participants. All participants played the game for 20 minutes once a week for 12 – 14 weeks. Biofeedback measures were included and tracked participant physiological and emotional responses to the game and changed dynamically based upon the player's physical and emotional state. The more tense or emotional a person became, the more difficult the tasks in the game became. Similarly, the more relaxed a participant became the easier the task in the video game became. The game featured three mini-games which helped players learn to increase planning skills, self-soothing and self-relaxation skills, emotional regulation, stress management, tolerance to cope with adversity, and delaying impulsive responses. After the treatment intervention, participants exhibited new coping styles when confronted with everyday obstacles and a greater amount of self-control strategies.

Video games are being used as tools in biofeedback. *Nevermind* is a biofeedback-enhanced horror adventure game originally developed as a master's thesis project by Erin Reynolds (2013). The gameplay in *Nevermind* is puzzle-based and created intentionally to elicit fear and anxiety as a means to help players become more aware of their internal experiences. As a player's anxiety and stress increase, so does the difficulty of the game. However, if a player is able to gain control over their anxiety, the difficulty level scales down. Thus, *Nevermind* teaches emotion regulation and stress management in a fun and engaging way (Reynolds, 2013).

Current Study

In light of the above research, this study seeks to examine the impact of video games on mental health including depression, anxiety, and aggression. By tracking the amount of time played and what type of game a gamer plays (shooter, role-playing, cooperative, etc.) and comparing it to general indicators of mental health (anxiety, depression, quality of life), this study aims to better understand the relationship between gaming and mental health. It is hypothesized1) individuals who play video games do not exhibit an unusual amount of psychopathology; 2) playing video games does not increase pathology, particularly aggression; 3) when used in specific conditions, video games can actually reduce pathology; 4) personality constellations are related to habits and behaviors related to gaming; and 5) pathology is related to specific gaming habits such as type of game played (e.g. shooters, role playing games) or behaviors such as "trolling" (attempting to aggravate other players or disrupting gameplay as a means of entertainment).

For purposes of this study, a "gamer" is defined as any individual who plays video games on a regular basis (at least once a week). A video game is defined as an interactive digital medium and includes casual games such as *Bejeweled* and *Farmville* as well as single-player, multi-player, competitive, and online role-playing games. To qualify for the study, all participants had to have a gamertag (an online handle or username) and the ability to play console or computer games online.

## Methods

### Participants

Participants were 322 individuals recruited through the online gaming forums P. M. S. Clan, GrifballHub, and Rooster Teeth and through the social media tool Twitter with the goal of achieving a minimum of 100 participants. The sample was more male, international, and older than the typical university sample of convenience (see Table 1 for examples). (See Appendix C for recruitment post).

Table 1 – Sample Demographics

| | | | | |
|---|---|---|---|---|
| Gender | Male (80.3) | Female (18.8) | | |
| Age | X=23.9, SD=5.7 | Min=13 | Max=50 | |
| Marital Status | Never (73.5) | Yes (18.5) | Divorced (1.5) | |
| Ethnicity* | European (69.2) | Asian (10.2) | Native American (6.5) | African (3.1) |
| Country | USA (81.2) | Europe (7.4) | Canada (7.1) | Australia (2.5) |

Values in parenthesis are percent of respondents, may not sum to 100 due to nonresponse

**Overall Procedure**

This project consisted of three interrelated studies, the first part was a collection of baseline data concerning participant demographic, personality, distress, and gaming expectations. The second part consisted on tracking participant actual gaming hours for 30 days and then following up on personality and distress changes. The third part consisted of tracking gaming hours over the most recent 30 days during a six month follow-up.

**Procedure Study 1**

For study 1, participants were directed to an online informed consent document and required to indicate they had read and understood their rights to confidentiality and to discontinue participation at any time. Next, all participants were linked to the first page of the questionnaire, which assessed demographic information (i.e., age, race, GPA/ income, relationship status), gaming habits (i.e. reasons for playing video games, beliefs about video games, etc.) and required the participant to enter their Raptr account. If a participant did not have a Raptr account, instructions were provided on how to obtain one. After the demographic information was collected, participants were directed to online versions of the State-Trait Anxiety Inventory (State questions only), Beck Depression Inventory-II, NEO-FFI, STAXI, and Quality of Life Inventory (see "Measures" section for more detail). Participants were also asked to estimate how much they anticipated gaming over the next 30 days.

**Procedure Study 2**

Thirty days after completing the initial questionnaire, participants were sent a follow-up questionnaire that was essentially identical to the original questionnaire. Participants were informed each time that they completed the questionnaire (up to two times), they would be entered into a raffle for the chance to win a $60 Amazon.com gift card. Four gift cards were available to be won. $60 was determined to be an appropriate amount considering it is the approximate cost of a new video game. The experimenter also reviewed participants' Raptr accounts to determine their Xbox video gaming frequency and preference (shooter or not) over the previous 30 days.

**Procedure Study 3**

Six months after completing the second set of questionnaires, participants' Raptr accounts were reviewed one last time in order to assess their video gaming frequency over the previous 30 days, and game preference (shooter or not).

**Measures**

Time spent playing video games were recorded by using the online client Raptr. Participants linked their gamertags to their Raptr profile and the online client then was able to keep track of what game the participant played and for how long. Play-time information was available in 7-day, 30-day, and all-time increments.

The Beck Depression Inventory Second Edition (BDI-II; Beck, Steer & Brown, 1996) is a 21-item multiple choice self-report questionnaire designed to measure severity of depression. Each question is valued on a four-point scale from zero to three and scores can range from zero to 63. Two questions (#16 and #18) contain seven options for identifying increases or decreases in sleep and appetite. Cutoff scores for the BDI are as follows: 0 – 13: minimal depression; 14 - 19: mild depression; 20 – 28: moderate depression; 29 – 63: severe depression. The BDI-II has been found to be reliable (.80) with good test-retest reliability at .93 ($p$<.001). The BDI-II has also been found to be valid at .93 ($p$<.001). Examples of items on the BDI-II include, "I do not feel sad 0, I feel sad much of the time 1, I am sad all the time 2, I am so sad or unhappy I can't stand it 3" and "I have not experienced any change in my appetite 0, my appetite is somewhat less than usual 1a, my appetite is somewhat greater than usual 1b, my appetite is much less

than before 2a, my appetite is much greater than usual 2b, I have no appetite at all 3a, I crave food all the time 3b."

The State-Trait Anxiety Inventory (STAI; Spielberger, 2005) is a 40-item multiple choice self-report questionnaire designed to measures both state and trait anxiety in adults. The state and trait sections of the test can be administered independently. The State-Anxiety Scale is made up of 20 four-point questions that range from 'Not at All' to 'Very Much So.' Examples of questions from the State-Anxiety Scale would be, "I feel at ease" or "I feel upset." The Trait-Anxiety scale is comprised of 20 four-point questions that range from 'Almost Never' to 'Almost Always.' Examples of questions from the Trait-Anxiety Scale would be, "I am a steady person" and "I lack self-confidence." Scores range from 20 to 80 with higher scores indicating higher levels of anxiety. When compared to other anxiety scales, the STAI has demonstrated congruent validity between .73 and .85. In regards to reliability, test-retest data demonstrated a correlation of .40 for state anxiety and .86 for trait anxiety.

The Quality of Life Inventory (QLI; Frisch, 1994) is a 32-item likert-type scale self-report questionnaire designed to measure life satisfaction. The inventory identifies 16 areas that impact life satisfaction: health, self-esteem, goals and values, money, work, play, learning, creativity, helping, friends, children, relatives, home, neighborhood, and community. Each area has two questions associated with it. The first question is on a three-point likert-type scale assessing how important the specific area is to a person's happiness. The second inquires how satisfied the person is with that particular area and to rate their satisfaction on a six-point likert scale. For example, under the area of

creativity, “Creativity is using your imagination to come up with new and clever ways to solve everyday problems or to pursue a hobby like painting, photography, or needlework. This can include decorating your home, playing the guitar, or finding a new way to solve a problem at work. How important is CREATIVITY to your happiness? Not important 0, important 1, extremely important 2. How satisfied are you with your CREATIVITY? Very dissatisfied -3, somewhat dissatisfied -2, a little dissatisfied -1, a little satisfied 1, somewhat satisfied 2, very satisfied 3.” The QLI demonstrates reliability in the .70s.

The NEO Five Factor Inventory-3 is a 60 item questionnaire based off of the NEO Personality Inventory-3, and is a measure of the five major domains of personality with 12 questions per domain: Neuroticism, Extraversion, Openness to Experience, Agreeableness and Conscientiousness.

The State-Trait Anger Expression Inventory-2 (STAXI-2; Spielberger 1999) is a 57-item four-point likert scale inventory designed to measure the intensity of anger during different emotional states and the disposition toward experiencing anger as a personality trait. The STAXI-2 utilizes six scales to identify the intensity of experienced anger and the likelihood of experiencing angry emotion, and the frequency of anger expression, control, and experience. Specifically, the STAXI-2 tests for outward expression of anger, suppression of anger, control of outward anger expression, and control of inward anger suppression.

A list of 30 different video game titles was retrieved from Amazon.com’s top 100 best-selling video games list. Two raters coded these games into either a “shooter” or

“non-shooter” category. Each rater is a member of an online gaming community and was considered to have adequate general knowledge of video games. A shooter video game is a subgenre of action video games wherein the player progresses by means of combat, typically with the aid of projectile weapons. Non-shooter video games encompass a wide range of gaming genres including puzzle, role-playing, and racing games. Although combat me be present, exploration, quest completion, problem-solving, and complex story-telling are the predominate gaming elements in a non-shooter. The raters had 100% agreement in categorizing the reviewed games.

Three self-report questions were used to gather information on the frequency of trolling behaviors. These questions were “An internet troll is defined as a person who posts inflammatory, off-topic, or offensive posts that derail or disrupt the normal discussion that occurs in an online community, often with the purpose of gaining attention or upsetting other members of the community. Based off this definition, how often do you troll?” “Do you like to post statements online that bait others or otherwise make them angry?”, and “Do you like making other players "rage" by methods such as team killing, stat padding, cheating, trash talk, et cetera?”

**Results Study 1**

**As mentioned above, the demographics can be found in Table 1, and suggest that while many groups are represented that the sample did tend to be male, younger, and unmarried as compared to the population of the United States. T**he sample did not appear to be unusually pathological at baseline. F, where the sample

reported being more open to new experiences (34.4 (5.8) versus 28.2 (6.2)less distressed than the average person

Table 2:

Comparisons of current sample to similar norms for BDI-II, STAXI-2, STAI-S, and NEO-FFI

| | Current Sample | | | | Comparison Norms | | | |
|---|---|---|---|---|---|---|---|---|
| | n | mean (SD) | 95% CI lower | 95% CI higher | n | mean (SD) | 95% CI lower | 95% CI higher |
| BDI-II | 287 | 10.1 (8.7) | 8.1 | 12.1 | 1022 | 9.11 (7.5) | 8.2 | 10.1 |
| | | | | | 229 | 9.12 (8.5) | 6.9 | 11.3 |
| STAXI-2-State* | 307 | 16.7 (4.7) | 15.7 | 17.8 | 1613 | 18.4 (6.1) | 17.9 | 19 |
| STAXI-2-Trait | 307 | 16.9 (4.7) | 15.8 | 17.9 | 1600 | 18.1 (5.2) | 17.6 | 18.6 |
| STAI-State* | 256 | 31.5 (10.7) | 28.9 | 34.1 | 484 | 35.8 (9.5) | 34.1 | 37.4 |
| NEO-Neuroticism | 297 | 21.9 (9.2) | 19.8 | 24.0 | 465 | 20.8 (7.7) | 19.4 | 22.2 |
| NEO-Extraversion | 297 | 27.4 (7.2) | 25.8 | 29.0 | 465 | 28.2 (6.2) | 27.1 | 29.3 |
| NEO-Openness* | 297 | 34.4 (5.8) | 33.0 | 35.7 | 465 | 28.4 (6.3) | 27.3 | 29.5 |
| NEO-Agreeableness | 297 | 31.5 (6.6) | 30.0 | 33.0 | 465 | 32.1 (6) | 31.0 | 33.2 |
| NEO-Conscientious | 297 | 30 (7.3) | 28.3 | 31.6 | 465 | 32.5 (6.3) | 31.4 | 33.6 |

**In terms of how much participants expected to game in the next 30 days,** **e**textraversion (E), conscientiousness (C) trait (TANG), and depression (BDI)albeit weakly and second column of Table 1 Extraversion and conscientiousness were related to lower estimates of future gaming, depression and trait anger were related to higher estimates. There was some overlap in these concepts in that extraversion and conscientiousness were also negatively related to depression and trait anger (r's ranged from -.16 to -.27). When all four were entered into a stepwise regression, conscientiousness and trait anger uniquely (albeit still weakly) predicted estimated gaming (*B*= -.15 and .13 respectively, $F(2,293)=7.155$, $p<.001$, $R^2_{adj}=.04$), while extraversion and depression did not. While depression did not reach significance, it was a trend (*B*= -.11, $t(1,294)=1.837$, $p=.067$) suggesting that extraversion was the one that most overlapped with the other three in terms of predicting estimated gaming.

Figure 1

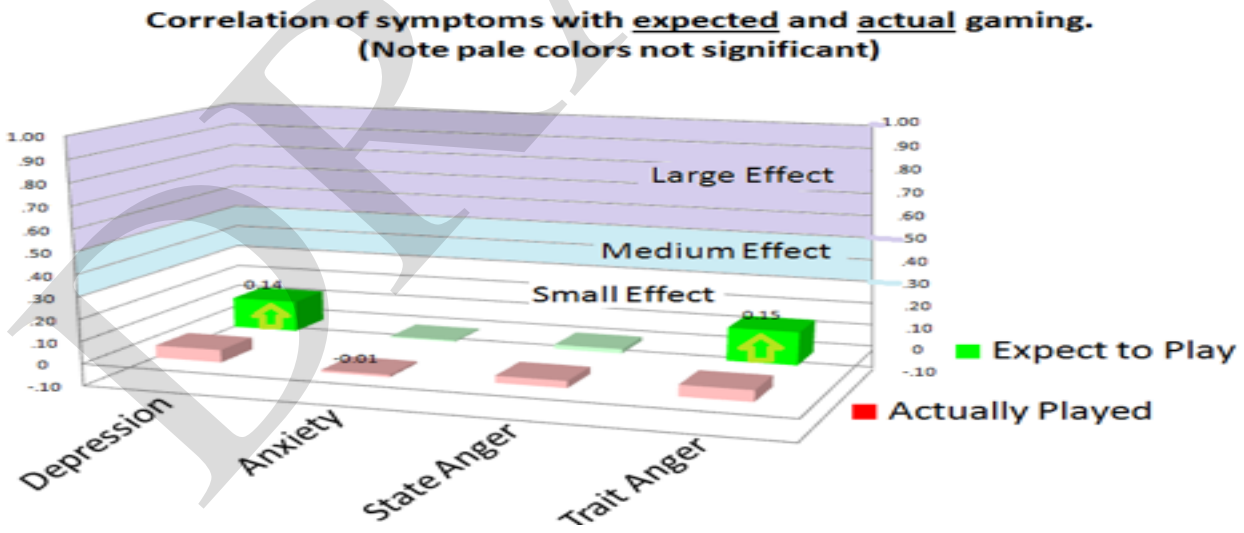


Table 3 – Personality and Distress as related to Expected Gaming

| | Hours Est | N | E | O | A | C | SANG | TANG | BDI | STAI |
|---|---|---|---|---|---|---|---|---|---|---|
| Hours Estimated | 1 | .076 | -.116 | .032 | -.108 | -.181 | .019 | .154 | .143 | .006 |
| N | .076 | 1 | -.338 | .074 | -.109 | -.378 | .255 | .455 | .624 | .577 |
| E | -.116 | -.338 | 1 | .142 | .146 | .284 | -.081 | -.186 | -.268 | -.211 |
| O | .032 | .074 | .142 | 1 | .168 | .084 | -.022 | .007 | .082 | .000 |
| A | -.108 | -.109 | .146 | .168 | 1 | .170 | -.196 | -.483 | -.172 | -.201 |
| C | -.181 | -.378 | .284 | .084 | .170 | 1 | -.119 | -.156 | -.229 | -.155 |
| SANG | .019 | .255 | -.081 | -.022 | -.196 | -.119 | 1 | .238 | .318 | .501 |
| TANG | .154 | .455 | -.186 | .007 | -.483 | -.156 | .238 | 1 | .484 | .381 |
| BDI | .143 | .624 | -.268 | .082 | -.172 | -.229 | .318 | .484 | 1 | .704 |
| STAI | .006 | .577 | -.211 | .000 | -.201 | -.155 | .501 | .381 | .704 | 1 |

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Gaming habits (trolling and playing games focused on shooting), did not influence the number of hours estimated however they did reveal two very different personality profiles (see Table 4). Trolling behavior was moderately related to less agreeableness (r=-.38), and weakly related to less conscientiousness (r=-.14),but was also related to greater trait anger (.23), state anger (.18), and anxiety (.15). Playing shooters was only weakly related to greater conscientiousness (.13).

Table 4 – Gaming habits as related to expected gaming, traits, and distress

| | Trolling | Shooter |
|---|---|---|
| Trolling | 1 | -.028 |
| Shooter | -.028 | 1 |
| Hours Estimated | .070 | -.087 |

| | | |
|---|---|---|
| N | .041 | -.113 |
| E | -.011 | .012 |
| O | -.095 | -.074 |
| A | -.379 | -.003 |
| C | -.140 | .128* |
| SANG | .178 | -.011 |
| TANG | .223 | .006 |
| BDI | .104 | -.034 |
| STAI | .152 | -.018 |

**Discussion Study 1**

Study 1 sought to determine whether 1) gamers exhibited greater amounts of pathological symptoms when compared to norms; 2) gamers were not angrier than average; 3) gaming could decrease experienced pathology; 4) personality influenced gaming; and 5) pathology is related to certain gaming habits such as trolling and playing shooters.

The sample obtained in Study 1 was comprised of approximately 80% male and 20% female. Although the percentage of women involved is greater than many previous studies (CITE), it still is not reflective of the percentage of women in the gaming population (47%, ESA, 2012). Therefore, these findings may pertain more toward male gamers than female gamers. Furthermore, the majority of participants played video games on an Xbox and therefore may not be representative of individuals who play other consoles, such as the Wii or PlayStation, or are computer gamers.

As shown in Table *X, gamers did not manifest unusual pathology at baseline. Furthermore, it was found that gamers reported less state distress (anxiety and anger)

compared to average. Study 1 identified gamers as having personality scores within normal limits with the exception of NEO-Openness. This indicates gamers are more open to new experiences compared to sample norms. This finding makes logical sense as gamers are frequently exposed to a wide variety of game genres (first-person shooter, role playing game, puzzle, etc), game mechanics, level designs, and virtual environments.

Gaming habits were examined via trolling behaviors and shooter video games. Trait anger, state anger, and anxiety were all positively related to trolling behaviors. There was not a significant relationship between pathology and playing shooters. In addition, personality had an influential role in the expression of gaming habits. Trolling behavior was moderately related to less agreeableness, weakly related to less conscientiousness, and greater conscientiousness was weakly related to playing shooters. In short, participants who endorsed being less agreeable, less conscientious, more anxious, and experiencing more anger in the moment and over time engaged in trolling behaviors. No such result was found for participants who played shooters. Taken together, these results suggest personality constructs and pathology are predictive of maladaptive behaviors (such as deriving enjoyment from aggravating others) whereas playing a violent shooter game is not.

Personality also played a role in how much participants expected to game. Participants who expressed more conscientiousness and more extraversion tended to predict lower amounts of time spent gaming. Conversely, participants who reported higher levels of depression and trait anger predicted greater amounts of gaming time. This finding indicates that individuals with higher levels of pathology predict spending

more time gaming. This result is particularly relevant for future studies on gaming as many studies require participants to estimate how much time they spend playing video games. If participants with greater psychopathology report larger amounts of time spent gaming, as this result suggests, it is likely that a relationship will be found between time spent gaming and pathology where one does not necessarily exist. Instead of measuring the relationship between time spent gaming and pathology, studies which use self-report estimations of gaming time may instead be measuring mood bias.

Another possible explanation for the relationship between pathology and reported playing time may be the expected use of video games as a kind of treatment for experienced distress. For example, video games may be used to "self-medicate" or temporarily escape reality. It is not unusual for individuals to find ways to distract themselves from problems they face by engaging in other activities. In fact, distraction is often used as a technique for helping to manage overwhelming emotions (Linehan, 1993). Games can also be used for releasing stress, making social connections, or experiencing feelings of mastery and competence. Perhaps distressed individuals estimate greater amount of time spent playing video games because they want to spend more time having the positive experiences of socialization and achievement. The relationship between extraversion and distress was weak and most likely to be dropped as per the stepwise analysis. Therefore, it may be the distress experienced by participants relates more to distress associated with introversion. Individuals who identify strongly as introverted often have fewer social contacts and express a greater degree of loneliness (Torgersen,

2013) while extraversion is often predictive of happiness (Zelenski, Sobocko, & Whelan, 2014).

From the findings above, it can be surmised that gamers are not more pathological than the norm simply because they play video games, that maladaptive gaming habits likely derive from personality constellations and experienced distress and not from playing a shooter video game, and individuals who experience greater distress estimate spending more time playing video games than individuals who are less distressed. However, these findings present more questions to be examined. First, how well do estimates of gaming time reflect actual time spent gaming? Secondly, does the disconnect between estimated gaming and actual gaming influence distress?

**Results Study 2**

Of the 322 original individuals, 266 made their Raptr account accessible to the research team (82%). There were no differences on measures of demographics, personality, or distress between individuals who made their accounts accessible (and thus the researchers were able to track gaming habits) and those who did not**.**

Pathology or distress (SANG, TANG, BDI. STAI) was not predictive of actual time spent playing video games or of the difference between estimates and actual gaming (see Table 5, all $p > .05$; $r$'s $<| 0.1|$). Three personality traits were predictive, albeit weakly (E, A, C) such that lower levels of these traits predicted more gaming. As these traits were inversely related to trolling, it is not surprising that greater self-reports of trolling were related to increased game time (r=.19).

Estimates of game time and actual gaming were only weakly correlated at $r$=.23 ($p<.001$). Neither traits, habits, nor distress predicted discrepancies between estimates and actual gaming time aside from neuroticism, which had a weak positive correlation of $r$=.14 ($p<.05$) such that more neurotic individuals were likely to overestimate their gaming habits, and trolling, which was related to a weak negative correlation of $-r$=. 11($p<.05$) such that individuals reporting more trolling behavior were likely to underestimate their gaming time.

Table 5: Baseline Traits and Distress predicting gaming time and discrepancy between actual and estimated gaming time

| | Actual Gaming Hours | Estimated-Actual Gaming |
|---|---|---|
| N | -.049 | .136 |
| E | -.142 | .039 |
| O | -.093 | .100 |
| A | -.177 | .060 |
| C | -.126 | -.053 |
| SANG | .031 | -.070 |
| TANG | .051 | .094 |
| BDI | .056 | .071 |
| STAI | -.007 | .012 |
| Trolling | .188 | -.114 |
| Shooter | -.124 | .055 |



In terms of gaming predicting a change in either pathology or traits, first an analysis of attrition is needed. Of the 266 individuals who completed the questionnaires

only 65 (24%) completed the questionnaires at time 2. While this subset did not differ in terms of predicted gaming habits, age, personality traits, or pathology, they did differ in terms of amount of time that they actually played video games such that those who played more were over-represented at time 2, 105.26 hours (67.95) versus 68.01 (54.86) hours per 30 days ($t(264)=-4.417$, $p<.001$). This was likely due to reduced interest and involvement in the internet, and anecdotal reports indicated some who played less believed that their data were no longer relevant due to not being "enough of a gamer".

Actual gaming was not found to predict pathology (see table 6). The discrepancy between estimated and actual gaming was found to predict increases in both trait anger ($r=.23$) and anxiety ($r=.25$) such that participants who did not play video games as often as they estimated were more likely to see increases in anxiety and anger. Given participants who dropped out of the study predicted an equivalent level of gaming, but played significantly less, this effect may be underestimated due to missing data.

Table 6: Increases in Traits and Distress as related to actual gaming time and discrepancy between actual and estimated gaming time

| Increase in | Actual Gaming Hours | Estimated-Actual Gaming |
|---|---|---|
| N | -.019 | -.016 |
| E | .011 | -.059 |
| O | -.069 | -.093 |
| A | -.018 | .025 |
| C | .050 | -.026 |

| | | |
|---|---|---|
| SANG | .153 | -.009 |
| TANG | -.009 | .230 |
| BDI | -.031 | -.016 |
| STAI | -.150 | .249 |

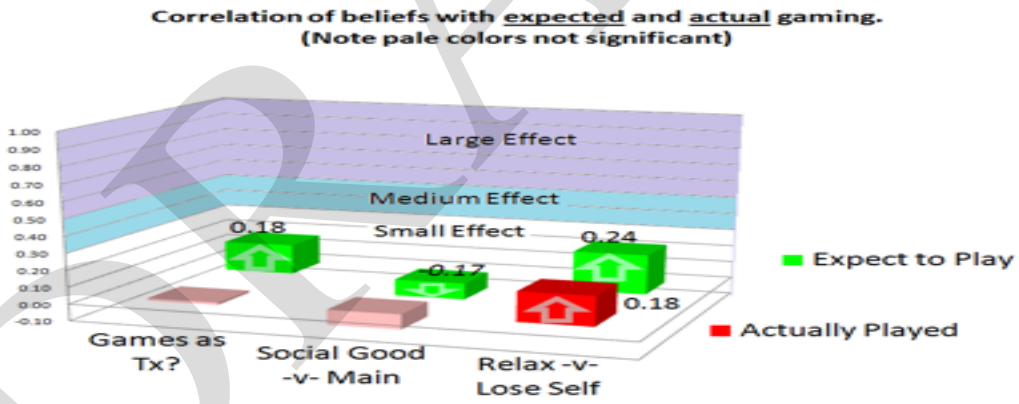
Gaming habits did have an impact on changes in traits and distress such that individuals who reported more trolling behaviors at baseline did also demonstrate less state anger (-.20), but not less trait anger 30 days later. People who were observed via Raptr to engage primarily in shooter games reported high levels of extraversion (point-biserial correlation =.23), less state anger (-24), and less anxiety (-.22).

Table 7: Increases in Traits and Distress as related to self-reported trolling habits at baseline, or observed via Raptr to primarily play shooters

| Increase in | Trolling | Shooter |
|---|---|---|
| N | .039 | -.075 |
| E | .088 | .229 |
| O | .087 | -.091 |
| A | .007 | -.176 |
| C | .050 | .091 |
| SANG | -.203* | -.237 |
| TANG | -.034 | .127 |
| BDI | -.010 | -.034 |
| STAI | -.026 | -.219* |

Beliefs about playing video games correlated with expected and actual gaming time. Individuals who endorsed using video games as relaxation and as mental health treatment demonstrated an increase in expected play (games as treatment $r$ = .18; games as relaxation $r$ = .24). However, only video games as relaxation was accurate in predicting actual time played ($r$ = .18). Beliefs that video games were a good place to socialize produced a decrease in expected play ($r$ = -0.17) but was not predictive of actual play time. (See Figure 2).

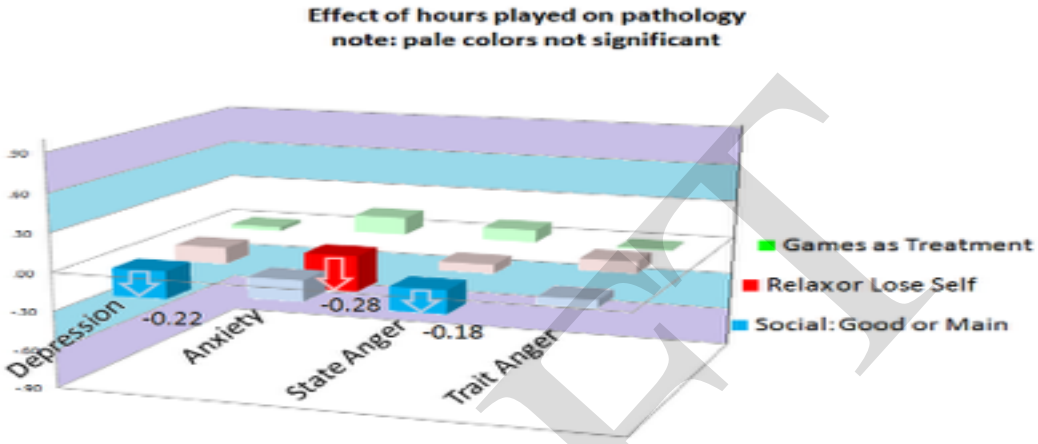
Figure 2




Beliefs about playing video games were correlated with pathology. Participants who endorsed video games as a beneficial way to socialize (as opposed video games as a main medium for socialization) experienced decreases in depression ($r$ = -0.22) and state

anger ($r$ = -0.18). Participants who expressed using video games as a method of relaxation (as opposed to escaping reality) experienced a decrease in anxiety ($r$ = -0.28). Participants who endorsed video games as a method for managing their mental health concerns experienced non-significantly worse symptoms. (See Figure 4).

Figure 4




**Discussion Study 2**

Because many participants who took the initial survey did not complete the survey at time 2, a bias is possible in the average of actual gaming hours collected at time 2. Most notably, participants at time 2 appeared to be over-represented by individuals who spent more time playing video games. During the initial recruitment period, the recruitment article was posted on the front page of all of the participating internet sites as well in dedicated forum threads on each site. At time 2, the recruitment article was published on the front page of two of the three sites, as well as in the appropriate forum threads. The site which did not promote the time 2 questionnaire prominently had greatest number of community members and the largest social reach. Therefore, it is possible that

the decrease in participants completing the questionnaires at time 2 was due to decreased awareness. This may also explain why individuals who gamed more were over-represented at time 2. It is possible that individuals who spend more time reading and participating in online gaming forums are more likely to be invested in gaming culture and spend more time playing video games. Although the follow-up questionnaires were less publicly promoted, individuals who were involved on the gaming websites viewed the time 2 questionnaires regardless of whether it was published on the main page of a site. Therefore, the increase in time 2 average hours may be biased due to a self-selecting sample of more dedicated and engaged gamers. Conversely, it is possible that less dedicated individuals loss interest in the study and declined to complete the time 2 questionnaires.

Baseline levels of pathology or distress levels were not predictive of actual gaming hours. However, the presence of mood disturbance, namely elevated trait anger and anxiety, was predictive of discrepancies between estimated hours and actual gaming hours. In short, individuals who expressed higher levels of trait anger or anxiety were more likely to overestimate the amount of time they spent gaming. Neuroimaging studies have found that mood and cognition substrates overlap in the brain (Chepenik, Cornew, & Farah, 2007), and cognitive processes, such as attention and memory, can be impacted by a mood disturbance (American Psychiatric Association, 2000). Therefore, gamers with greater trait anger or anxiety may not accurately predict time engaged in gaming due to the impact of mood on their cognitive processes.

Some gaming habits correlated with changes in pathology and distress. Individuals who reported engaging in trolling behaviors at time 1 demonstrated less state anger but not less trait anger when re-evaluated after 30 days. This may suggest that individuals who troll find immediate relief from their anger by antagonizing others, but that this relief is temporary and is not reflective of an effective means to managing their anger over time.

Participants who played shooter video games were found to be more extraverted, and to be less angry and less anxious than those who did not regularly play shooters. Shooter video games frequently feature multi-player modes which enable the player to interact socially and competitively with others. Other genres of games, such as racing, role-playing, and puzzle games tend to be more individual-focused. Individuals who are more extraverted, or wish they were more extraverted, may be more likely to play shooters for social engagement. While video games overall have been shown to act as stress management tools (Reinecke, 2009), shooters in particular may be relaxing for extraverts due to the social and competitive environment.

**Results Study 3**

Of the 66 participants at time 2, Raptr accounts were accessed 6 months later to determine gaming at that point. Data were available for 62 of them. In terms of comparing this group versus the 266 who provided baseline and 30 day gaming behavior, this subsample was similarly biased in terms of a greater degree of gaming ($t(302)=-3.249$, $p=.001$, 98.98 (67.17) for the subsample versus 70.48 (56.67) for the dropouts). However, there were also differences in lower depression ($t(302)=2.284$, $p=$.

023, 7.9 (7.71) versus 10.74 (8.98) for dropouts) and less anxiety (t(302)=1.986, p=.048, 29.12 (9.18) versus 32.17 (10.76) for dropouts. While this may indicate a protective factor associated with gaming, it might also be due to greater distress and dropping out both being caused by external life events. In terms of biasing the sample, caution should be used as the time 3 sample is unusually healthy compared to the original. It should be noted that there were no significant differences in changes in pathology or traits from the subsample of individuals who completed questionnaires at time 2 and provided follow-up Raptr data versus those who completed questionnaires at time 2 and did not provide follow-up data, however the sample size was likely insufficient to detect such differences with so few missing participants from time 2 to time 3.

Video game time was very consistent from time 2 to time 3, r=.63, p<.001. Surprisingly, playing a shooter or not was not consistent ($chi^2(1)=1.305$, p=.253) and resembled a coin toss with 57% remaining consistent and 43% switching. ANOVAs using time 2 and time 3 video game preference as independent variables did not have any significant effects, although this may have been due to reduced sample sizes.

For baseline measures predicting time 3 video game habits, only extraversion (-.29) and openness to new experience (-.24) predicted (see Table 8).

Table 8 – Increases in Traits and Distress as related to Gaming After Six Months

| | Video gaming at 6 months |
|---|---|
| N | .009 |
| E | -.294* |

| | |
|---|---|
| O | -.242* |
| A | -.035 |
| C | -.074 |
| SANG | -.072 |
| TANG | .099 |
| BDI | .101 |
| STAI | .119 |

For differences in traits and pathology from time 1 to time 2 predicting video gaming habits at time 3, only a decrease in openness to new experience remained a predictor (r=-.25) although conscientiousness and extraversion were trends at r=.20 (p=.07; see table 9)

Table 9 – Differences in Traits and Pathology from Time 1 to Time 2

| Increase in | Video gaming at 6 months |
|---|---|
| N | -.161 |
| E | 0.199 |
| O | -.245* |
| A | -.116 |
| C | .202 |
| SANG | .185 |
| TANG | -.080 |
| BDI | -.104 |

| | |
|---|---|
| STAI | -.129 |

**Discussion Study 3**

Study 3 found gamers to be very consistent in their play time over a six month period. However, there was great inconsistency regarding whether the participant played a shooter or non-shooter game. This inconsistency may reflect the diverse and growing video game industry. There were more video games published during the quarter in which Study 1 and Study 2 were conducted than all of the games that were released in 2000 combined. Study 1 found that gamers are more open to new experiences and this openness may be reflected in gamers' engagement in a variety of games and game genres, especially when there are so many different titles being made available.

**Discussion**

The purpose of this series of studies was to clarify the connection between video game use and mental health. Data from Study 1 confirmed null hypothesis 1, that people who play video games are not more or less pathological than sample norms. Participants who experienced an increase in negative mental health indicators after Survey 2 initially reported concern regarding their use of video games. These concerns included not being able to socialize outside of video games, getting lost in video games, and using video games to manage mental health symptoms. Psychopathology was not correlated with video game play, even in participants who averaged 30 or more hours of gaming per week. This is consistent with previous research demonstrating a decline in "problem"

symptoms related to video games over time without any intervention (King, Delfabbro, & Griffiths, 2013). The only way in which the study's sample was significantly different from the norm was in being more open to new experiences.

Hypothesis 2 predicted that playing video games does not increase pathology. This hypothesis was supported by results from Studies 2 and 3. Gaming time was not predictive of psychopathology across type of game played or time spent playing. Even when greater amounts of playing time was overrepresented in Study 2 and 3, no evidence was found linking increased playing time with increased pathology.

Hypothesis 3 predicted that video games could actually help alleviate some form of psychological distress. Results from the studies found that gamers do use video games as a relaxation strategy and that gaming significantly reduced anxiety. Furthermore, individuals who played mostly shooters actually experienced a decrease in anger. However, participants who endorsed using video games as a way to escape their problems or as a means to treating psychiatric symptoms did appear to experience non-significantly worse outcomes. Similarly, individuals who endorsed using video games as a way to connect and interact socially did not exhibit increased levels of distress (depression and state anger) while participants who stated video games were their main place for engaging socially did appear to experience increases in distress. Thus, it appears that the motivation behind gaming is more predictive of mental health status and outcomes rather than the content of the game or how much time a gamers plays.

Hypothesis 4 examined the role personality plays in predicting gaming habits and behaviors. Using the Five Factor Model of personality, participants were found to be in

the average range on the domains of Conscientiousness, Extraversion, Agreeableness, and Neuroticism and in the above average range for Openness. Thus, individuals who play video games appear to have overall average personality constellations while being more open to new experiences when compared to norms. Personality was found to be associated with trolling behaviors. Specifically, trolling behavior was inversely related to agreeableness and conscientiousness and directly related to state and trait anger, and anxiety. Other studies have found that low scores of agreeableness and conscientiousness accurately predict trolling behaviors (Markey & Markey, 2010; Buckles, Trapnell, & Paulhus, 2014; Paulhaus, Williams, & Harms, 2001; Paulhus & Williams, 2002). Although a consistent personality constellation was not apparent in this sample, participants who endorsed engaged in trolling behaviors did identify as being less agreeable and less conscientious and is therefore consistent with previous research on the personality makeup of trolls.

Hypothesis 5 predicted that pathology would be predictive of gaming habits. In particular, individuals with greater levels of pathology would be more likely to engage in trolling behaviors or play violent rather than non-violent games. Results indicate that individuals with greater levels of state and trait anger, anxiety, and lower amounts of conscientiousness and agreeableness were more likely to engage in trolling behaviors. Pathology was not predicative, however, of whether participants played a shooter or non-shooter game. This finding is especially relevant as the media frequently portrays violent video games as the trigger for psychologically-compromised individuals to engage in destructive acts. The evidence suggests that a person's mental health status and

personality, particularly their level of agreeableness and conscientiousness, is able to somewhat predict aggressive behaviors. Conversely, an individual's preference for shooter or non-shooter games had no predictive power pertaining to aggressive acts.

Video games have a documented history of engaging individuals in flow, a psychological state where a player can temporarily lose track of time, their surroundings, and the external environment (Ozcelik, Cragiltay, &Ozcelik, 2013). This can be problematic for video game researchers as they often rely on participants to estimate the amount of time spent playing video games (Anderson & Dill, 2000; Gitter, Ewell, Guadango, Stillman, & Baumeister, 2013; DeLisi, Vaugh, Gentile, Anderson, & Shook 2013; Jeong, Biocca, &Bohil, 2012; Fraser, Padilla-Walker, Coyne, Nelson, & Stockdale, 2012; Beck, Boys, Rose, & Beck, 2012; Coyne, Busby, Bushman, Gentile, Ridge, & Stockdale, 2012; Thomas &Lavont, 2012; Willoughby, Adachi, & Good, 2011; NijeBijvank, Konijn, & Bushman, 2011; Olson, Kutner, Baer, Beresin, Warner, &Nicholi, 2009; Gentile & Gentile, 2008; Wallenius, Punamaki, Rimpela, 2007; Eastin, 2007). Furthermore, results from this study suggest individuals with higher amounts of dysphoric symptoms and trait anger significantly overestimated their expected play time. It is possible results from previous research which found positive correlations between aggression, depression, and exposure to video games is the artifact of inaccurate reported chronology resulting from flow or negative mood-state bias.

Other studies measured mood and mental health indicators following in-vivo exposure to video games. However, many of these studies grant participants only five to 20 minutes of playtime (Valdez & Ferguson, 2011). In fact, a review of 40 studies on

video games and aggression published between 2008 and 2014 revealed 79% of studies allow participants 20 minutes or less of play time. Participants paired with unfamiliar games are likely to experience some frustration or competence impairment as they learn game mechanics, controller layout, and level design. Based on Przybylski, Deci, Rigby, and Ryan's (2013) findings, this lack of competence could translate to heightened levels of aggression. Therefore, it is neither the violence nor the video game that may be eliciting aggressive cognitions, emotions, or behaviors, but rather the truncating of the fundamental psychological need for competence.

Furthermore, an inverse effect size exists between playing time and aggression and becomes more significant the longer a participant plays the video game (Sherry, 2001). Video games have become quite intricate and their controls can be complex. For example, the Xbox 360 controller has eight buttons, two triggers, two thumb-sticks, and a D-pad and most Xbox 360 games have different controller setups. Paired with novel environments and varying styles of level design, learning to play a new video game can take time to adjust to, much less master. The spike in aggression measured in other studies is likely related to the frustration of learning new controller layouts, game mechanics, and level designs, rather than a behavioral response to violent content (Jerabeck& Ferguson, 2013; Sherry 2001). By obtaining user data through the Raptr client, this study avoided the previous time and player-competence pitfalls which may act as confounds in previous research.

The sample did appear to have a different proportion of males than the normative research, but had a roughly equivalent proportion of individuals of European Caucasian

descent and similar average age. In terms of distress and personality traits, the results confirmed that individuals on the internet reported the same traits as comparable normative samples who took the instruments with paper and pencil in a formal setting, with one exception, suggesting no internet bias. The one unpredicted finding was that the NEO measure of openness to new experience was higher for the internet sample. This likely is due to selecting a sample with online video game accounts. It seems plausible that these individuals may be more interested than the general population in new experiences. The more interesting finding was that state measures for the internet group were lower, suggesting that on average they were less angry and less anxious at that moment than individuals in a laboratory setting.

The implications of these findings for online research are that when examining trait measures and relationships, internet sampling is generally not likely to result in different results. The conclusions concerning state measures are more complicated, and depend on what the intent of the research is. If the intent is to generalize to an arguably more stressful and formal environment, then traditional data collection is most appropriate. However, if the intent is to generalize to the individual when they are in a more informal and naturalistic environment of choice, then internet research is likely to be more accurate. Much like research on hypertension (Pickering et al., 1988), it is possible that a great deal of traditional research has overpathologized individuals. As with research on the Fundamental Attribution Error (Choi et al, 2003), it is possible that we have discovered phenomena that cannot be generalized as far as we expect, and many theories of state functioning may be misleading and incomplete.

**Limitations**

As with traditional methods of research, care should be taken when collecting, evaluating and interpreting data collected through online samples. While online samples may be more diverse, care must be taken to recruit participants from appropriate online forums or social media. Without even intending to gather an international sample, close to 20% of the sample was from outside the United States. This could either be of great benefit in reveling true relationships or it may obscure patterns, and should be handled in a conscientious manner. In regards to using online assessment, initial results show promise on trait measures being consistent yet more research is needed to explore state and other measures.

Other limitations to consider include the overrepresentation of males in the study. While a predominately male sample may have been representative 10 years ago, the percentage of female gamers has been steadily rising over the last few years and women currently make up nearly 50% of gamers. In addition, the majority of participants were American, in their 20s, and played on the Xbox 360. There was little representation from Play Station or computer gamers. The Raptr client which tracked the hours and games played by participants was not available for mobile gamers. Thirty-three percent of individuals identify as playing video games on their mobile phones and 25% report playing on handheld devices (Entertainment, 2012). Therefore, results from this study may most accurately generalize to European-American males in their 20s who play predominantly on the Xbox 360.

# REFERENCES

Adachi, P. J. C., & Willoughby, T. (2011). The effect of video game violence and competition on aggressive behavior: Which characteristic has the greatest influence? *Psychology of Violence, 1*(4), 259-274. doi:10.1037/a0024908

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR*. Washington, DC: American Psychiatric Association.

Anderson, C. A., & Bushman, B. J. (2001) Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and pro-social behavior: A meta-analytic review f the scientific literature. *Psychological Science*, *12*, 353 – 359.

Anderson, C. A., & Dill, K. E. (2000).Video games and aggressive thoughts, feelings and behaviors in the laboratory and in life. *Journal of Personality and Social Psychology, 78*(4,) 772 - 790. doi:10.1037//O022-3514.78.4.772

Beck A. T., Steer R.A., & Brown, G. K. (1996).Manual for the Beck Depression Inventory-II. San Antonio, TX: Psychological Corporation

Beck, V. S., Boys, S., Rose, C., & Beck, E. (2012). Violence against women in video games: A prequel or sequel to rape myth acceptance? *Journal of Interpersonal Violence*.doi:10.1177/0886260512441078

Becker-Olsen, K. L. &Norberg, P. A. (2010). Caution, animated violence: Assessing the efficacy of violent video game ratings. *Journal of Advertising, 39*(4), 83 – 94. doi: 10.2753/JOA0091-3367390406

Brezinka, V. (2008). Treasure Hunt – A serious game to support psychotherapeutic treatment of children. *eHealth, Beyond the Horizon – Get IT There,* 71 – 76.

Buckles, E. E., Trapnell, P. D., & Paulhaus, D. L. (2014). Trolls just want to have fun. *Personality and Individual Differences, 67* 97-102 doi:10.1016/j.paid.2014.01.016

Ceranoglu, T. A. (2010). Video games in psychotherapy. *Review of General Psychology, 14*(2), 141 – 146. doi:10.1037/a0019439

Chepenik, L. G., Cornew, L. A., & Farah, M. J. (2007). The influence of sad mood on cognition. *Emotion, 7*(4), 802 – 811 DOI: 10.1037/1528-3542.7.4.802

Chory, R. M. &Goodboy, A. K. (2011). Is basic personality related to violent and non-violent video game play and preferences? *Cyberpsychology, Behavior and Social Networking, 14*(4), 191 - 198. doi:10.1089/cyber.2010.0076

Cooper, A. (2013). Psychophysiological and affective correlates of video games.The Ohio State University. https://kb.osu.edu/dspace/bitstream/handle/1811/58536/Cooper_UGthesis.pdf?sequence=1

Coyne, S. M., Busby, D., Bushman, B. J., Gentile, D. A., Ridge, R., & Stockdale, L. (2012).Gaming in the game of love: Effects of video games on conflict in couples.*Family Relations*, *61* (3), 388-396. doi:10.1111/j.1741-3729.2012.00712.x

Coyne, S. M., Padilla-Walker, L. M., Stockdale, L., & Day, R. D. (2011). Game on… girls: Associations between co-playing video games and adolescent behavioral and family outcomes. *Journal of Adolescent Health, 49*(2), 160-165. doi:10.1016/j.jadohealth.2010.11.249

DeLisi, M., Vaughn, M. G., Gentile, D. A., Anderson, C. A., & Shook, J. J. (2013). Violent video games, delinquency, and youth violence: New evidence. *Youth Violence and Juvenile Justice*, *11* (2), 132-142. doi:10.1177/1541204012460874

Eastin, M. S. (2007). The influence of competitive and cooperative group game play on state hostility. *Human Communication Research, 33 (4),* 450-466.

Entertainment Software Association (2010).Essential facts about the computer and video game industry. Retrieved from http://theesa.com/facts/pdfs/ESA Essential_Facts_2010.pdf

Entertainment Software Association (2012).Essential facts about the computer and video game industry. Retrieved from http://www.theesa.com/facts/pdfs/esa_ef_2012.pdf

Entertainment Software Association.(2013). Essential facts about the computer and video game industry. Retrieved from http://www.theesa.com/facts/pdfs/esa_ef_2013.pdf

Ferguson, C. J. (2007). The good, the bad and the ugly: A meta-analytic review of positive and negative effects of violent video games. *Psychiatry Quarterly, 78*, 309 – 316. doi:10.1007/s11126-007-9056-9

Ferguson, C. J., & Olson, C. K. (2014). Video game violence use among "vulnerable" populations: The impact of violent games on delinquency and bullying among

children with clinically elevated depression or attention deficit symptoms. *Journal of Youth and Adolescence, 43*(1), 127-136.doi:10.1007/s10964-013-9986-5

Ferguson, C. J., & Rueda, S. M. (2010). The Hitman study: Violent video game exposure effects on aggressive behavior, hostile feelings, and depression. *European Psychologist15*(2), 99-108. doi:10.1027/1016-9040/a000010

Ferguson, C. J., Rueda, S. M., Cruz, A. M., Ferguson, D. E., Fritz, S., & Smith, S. M. (2008). Violent video games and aggression: Causal relationship or byproduct of family violence and intrinsic violence motivation. *Criminal Justice and Behavior, 35*(3), 311 – 332. doi:10.1177/0093854807311719

Fernandez-Aranda, A. et al. (2012). Video games as a complementary therapy tool in mental disorders: PlayMancer, a European multicentre study. *Journal of Mental Health, 21*(4), 364-374. doi:10.3109/09638237.2012.664302

FoldIt.(2013). Crystal structure of a monomeric retroviral protease solved by protein folding game players.*Nature and Structure of Molecular Biology*. doi:10.1038/nsmb.2119

Foley, L. &Maddison, R. (2010). Use of active video games to increase physical activity in children: A (virtual) reality? *Pediatric Exercise Science, 22*, 7 – 20.

Fraser, A. M., Padilla-Walker, L. M., Coyne, S. M., Nelson, L. J., & Stockdale, L. A. (2012).Associations between violent video gaming, empathic concern, and prosocial behavior toward strangers, friends, and family members.*Journal of Youth and Adolescence*, *41* (5), 636-649. doi:10.1007/s10964-012-9742-2

Frisch, M. B.*Quality of life inventory.* Pearson, 19500 Bulverde Road, San Antonio, TX

Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., &Khoo, A. (2011). Pathological video game use among youths: A two-year long longitudinal study. *Pediatrics,* doi:10.1542/peds.2010-1353

Gentile, D.A., & Gentile, J. (2008). Violent video games as exemplary teachers: A conceptual analysis. *Journal of Youth and Adolescence, 37(2),* 127-141.

Gitter, S. A., Ewell, P. J., Guadagno, R. E., Stillman, T. F., & Baumeister, R. F. (2013). Virtually justifiable homicide: The effects of prosocial contexts on the link between violent video games, aggression, and prosocial and hostile cognition. *Aggressive Behavior*, *39* (5), 346-354. doi:10.1002/ab.21487

Granic, I., Lobel, A., &Engles, R. C. M. E. (2013).The benefits of playing video games.*American Psychologist, 69*(1), 66 – 78. doi:10.1037/a0034857

HopeLabs. (2006). Re-Mission: The game. http://www.remission.net/site/game/index.php

Jeong, E. J., Biocca, F. A., &Bohil, C. J. (2012). Sensory realism and mediated aggression in video games. *Computers in Human Behavior*, *28* (5), 1840-1848. doi:10.1016/j.chb.2012.05.002

Jerabeck, J.M., & Ferguson, C.J. (2013).The influence of solitary and cooperative violent video game play on aggressive and prosocial behavior.*Computers in Human Behavior, 29*, 2573-2578 doi:10.1016/j.chb.2013.06.034

Kato, P. M., Cole, S. W., Bradlyn, A. S., &Polluck, B. H. (2008). A video game improves behavioral outcomes in adolescents and young adults with cancer: A randomized trial. *Pediatrics, 122*, 305 – 317. doi: 10.1542/peds.2007-3134

Khatib, F., DiMaio, F., Cooper, S., Kazmierczyk, M., Gilski, M., Krzywda,S., Zabranska, H., Pichova, I., Thompson, J., Popović, Z.,Jaskolski, M., & Baker, M. (2011).

King, B. (2003). Educators turn to games for help. *Wired*. http://www.wired.com/gaming/gamingreviews/news/2003/08/59855

King, D. L., Delfabbro, P. H., & Griffiths, M. D. (2013). Trajectories of problem video gaming among adult regular gamers: An 18-Month longitudinal study.*Cyberpsychology, Behavior, and Social Networking*, *16* (1), 72-76.doi: 10.1089/cyber.2012.0062

Kovacs, M. (1992).*Manual of the Children's Depression Inventory*. Toronto: Multi-Heath Systems.

Linehan, M. M. (1993). Skills training manual for treating Borderline Personality Disorder. NY: Guilford Press.

LinkedWellness.(2013). SPARX the video game that treats depression. Retrieved from: http://linkedwellness.com/sparx-game/

Markey, P. M. & Markey, C. N. (2010). Vulnerability to violent video games: A review and integration of personality research. *Review of General Psychology, 14*(2), 82 – 91. doi:10.1037/a0019000

McGonical, J. (2011). Reality is broken: *Why games make us better and how they can change the world.* New York, NY: Penguin Group.

Mental Health Advisory Team of the United States Army.(2009). Mental Health Advisory Team 6 Operation Enduring Freedom 2009 Afghanistan. Retrieved from: http://

www.armymedicine.army.mil/reports/mhat/mhat_vi/MHAT_VI-OEF_Redacted.pdf

Mentzoni, R. A., Brunborg, G. S., Molde, H., Myrseth, H., Hetland, J., &Pallesen, S. (2011). Problematic video game use: Estimated prevalence and associations with mental and physical health. *Cyberpsychology, Behavior and Social Networking.* doi:10.1089/cyber.2010.0260.

Merry, S. N., Stasiak, K., Shepherd, M., Frampton, C., Fleming, T., Lucassen, M.F.G. (2012). The effectiveness of SPARX, a computerisedself help intervention for adolescents seeking help for depression: randomised controlled non-inferiority trial. *British Medical Journal,344*doi:http://dx.doi.org/10.1136/bmj.e2598

Messias, E., Castro, J., Saini, A., Usman, M., &Peeples, D. (2011). Sadness, suicide, and their association with video game and internet overuse among teens: results from the Youth Risk Behavior Survey 2007 and 2009. *Suicide and Life-Threatening Behavior, 41*(3), 307-315.

Ng, B. D., &Wiemer-Hastings, P. (2005).Addiction to the internet and online gaming.*CyberPsychology& Behavior, 8*(2), 110-113.

Nije Bijvank, M., Konijn, E. A., & Bushman, B. J. (2011). "We don't need no education": Video game preferences, video game motivations, and aggressiveness among adolescent boys of different educational ability levels. *Journal of Adolescence* .doi:10.1016/j.adolescence.2011.04.001

Olson, C. K., Kutner, L. A., Baer, L., Beresin, E. V., Warner, D. E., & Nicholi, A. M. (2009). M-rated video games and aggressive or problem behavior among young adolescents.*Applied Developmental Science, 13, 4*, 188-198.

Ozcelik, E., Cragiltay, N. E., &Ozcelik, N. S. (2013).The effect of uncertainty on learning in game-like environments.*Computers and Education* doi:10.1016/ j.compedu. 2013.02.009

Parkes, A., Sweeting, H., Wight, D., & Henderson, M. (2012). Do television and electronic games predict children's psychosocial adjustment? Longitudinal research using the UK Millennium Cohort Study.*Archives of Disease in Childhood, 0*, 1-8.doi:10.1136/archdischild-2011-301508

Paulhaus, D. L., & Williams, K. (2002). The dark triad of personality: Narcissism, Machiavellianism and psychopathy. *Journal of Research in Personality, 36* 556-563 dii

Paulhaus, D. L., Williams, K., & Harms, P. (2001). Shedding light on the dark triad of personality: Narcissism, Machiavellianism, and psychopathy. Presented at the 2001 Society for Personality and Social Psychology Convention in San Antonio, TX. http://www.academia.edu/1301947/Shedding_light_on_the_Dark_Triad_of_ personality_narcissism_Machiavellianism_and_psychopathy

Porter, G., Starcevic, V., Berle, D., &Fenech, P. (2010). Recognizing problem video game use. *Australian & New Zealand Journal of Psychiatry, 44*(2), 120-128. doi: 10.3109/00048670903279812

Przybylski, A. K., Deci, E. L., Rigby, C. S., & Ryan, R. M. (2014). Competence-impeding electronic games and players' aggressive feelings, thoughts and behaviors.*Journal of Personality and Social Psychology, 106*(3), 441-457. doi: 10.1037/a0034820

Reinecke, L. (2009). Games at work: The recreational use of computer games during work hours. Cyberpsychology& Behavior, *12*(4), 461-465. doi:10.1089/ cpb. 2009.0010

Reynolds, E. (2013). Nevermind: creating an entertaining biofeedback-enhanced game experience to train users in stress management. *ACM SIGGRAPH 2013 Posters*, *77*.ACM, New York, NY, USA. 1. doi:10.1145/2503385. 2503469 http:// doi.acm.org/10.1145/2503385.2503469

Rizzo, A. et al. (2011) Virtual reality goes to war: A brief review of the future of military behavioral healthcare. *Journal of Clinical Psychology in Medical Settings, 18*(2), 176-187.doi:10.1007/s10880-011-9247-2

Rosenberg, D., Depp, C. A., Vahia, I. V., Reichstadt, J., Palmer, B. W., Kerr, J., Norman, G., &Jeste, D.V. (2010). Exergames for subsyndromal depression in older adults: a pilot study of a novel intervention. *American Journal of Geriatric Psychiatry, 18*(3), 221-226 doi:10.1097/JGP.0b013e3181c534b5

Russoniello, C. V., Fish, M., O'Brien, K., Pougatchev, V. &Zirnov, E. (2011). The efficacy of prescribed casual video games in reducing clinical depression and anxiety. [PowerPoint slides]. Retrieved from http://www.ecu.edu/cs-hhp/rcls/ biofeedback/

Russoniello, C. V., O'Brien, K., & Parks, J. M. (2009). The effectiveness of casual video games in improving mood and decreasing stress. *Journal of CyberTherapy and Rehabilitation*, *2*(1), 53-66.

Sarr, E. (2014). IRL achievements: Gamification and mental health. *Penny Arcade Expo 2014*.Panelist presentation, Boston, MA.

Sheese, B. E., &Graziano, W. G. (2005).Deciding to defect. *Psychological Science (Wiley-Blackwell), 16*(5), 354-357. doi:10.1111/j.0956-7976.2005.01539.x

Sherry, J. L. (2001). The effect of violent video games on aggression: A meta-analysis. *Human Communication Research, 27*(3), 409-431 Retrieved from http:// www.icagames.comm.msu.edu/vgma.pdf

Spielberger, C. D. (1983). *Manual for the State-Trait Anxiety Inventory (STAI)*.PaloAlto, CA: Consulting Psychologists Press.

Sohnsmeyer, J., Gilbrich, H., &Weisser, B. (2010). Effect of a six-week-intervention with an activity-promoting video game on isometric muscle strength in elderly subjects. *International Journal of Computer Science in Sport, 9*, 75 – 79.

Starcevic, V., Berle, D., Porter, G., Fenech, P. (2011), Problem video game use and dimensions of psychopathology.*International Journal of Mental Health and Addiction.*9, 248-256.

Thomas, K., & Levant, R. (2012). Does the endorsement of traditional masculinity ideology moderate the relationship between exposure to violent video games and aggression? *The Journal of Men's Studies ,20* (1), 47-56. doi:10.3149/ jms. 2001.47

Torgesen, S. (2011), Personality may be psychopathology, and vice versa. World Psychiatry, *10,* 112–113. doi: 10.1002/j.2051-5545.2011.tb00030.x

Tseng, W. C., & Hsieh, R. L. Effects of short-term active video games play on community adults: Under International Classification of Functioning, Disability and Health consideration. Chinese Medical Journal 2013; *126*(12):2313-2319

Valdez, J. J., & Ferguson, C. J. (2011). Just a game after all: Violent video game exposure and time spent playing effects on hostile feelings, depression, and visuospatialcognition. *Computers in Human Behavior, 28*, 608 – 616. doi: 10.1016/j.chb. 2011.11.006

Ventura, M., Shute, V., & Zhao, W. (2013).The relationship between video game use and a performance-based measure of persistence.*Computers and Education*, *60*, 52-58. doi:10.1016/j.compedu.2012.07.003

Vygotsky, L. (1978). Interaction between learning and development.Mind and Society. 79-91. Cambridge, MA: Harvard University Press.

Wallenius, M., Punamäki, R., Rimpelä, A. (2007). Digital game playing and direct and indirect aggression in early adolescence: The roles of age, social intelligence, and parent-child communication. *Journal of Youth and Adolescence, 36(3),* 325-336.

Warburton, D. E.R., Bredin, S.D., Horita, L., Zbogar, D., Scott, J. M. Esch, B., & Rhodes, R. E. (2007). The health benefits of interactive video game exercise. Applied Physiology, Nutrition, and Metabolism*, 32*(4), 655 – 663.

Whitbourne, S. K., Ellenberg, S., & Akimoto, K. (2013). Reasons for playing casual video games and perceived benefits among adults 18 to 80 years

old.*Cyberpsychology, Behavior, and Social Networking*, *16*(12), 892-897. doi: 10.1089/cyber.2012.0705.

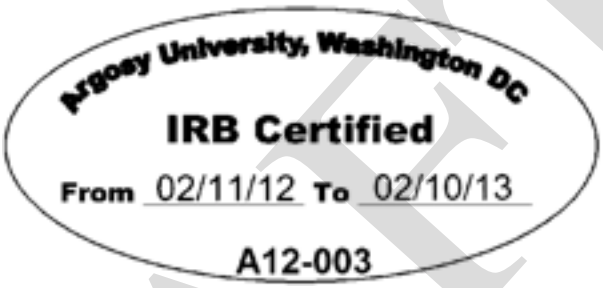
Willoughby, T., Adachi, P. J. C., & Good, M. (2011).A longitudinal study of the association between violent video game play and aggression among adolescents.*Developmental Psychology*.doi:10.1037/a0026046

Zelenski, J. M., Sobocko, K. & Whelan, D. C. (2014). Introversion, solitude, and subjective well-being. The Handbook of Solitude: Psychological Perspectives on Social Isolation, Social Withdrawl, and Being Alone. Coplan & Bowker (Eds.) John Wiley and Sons, CA.

Zipland Interactive. (2004). Earthquake in Zipland: Edutainment game for children of divorce. Retrieved from http://www.ziplandinteractive.com/

APPENDIX A

**Internal Review Board Approval**



APPENDIX B

**Letter of Informed Consent**

ARGOSY UNIVERSITY, WASHINGTON, D.C.
Consent Form for Research Investigation Involving Human Subjects
Research Project No. A12-003

a. I am invited by Kelli Dunlap, a doctoral candidate in Clinical Psychology at Argosy University, Washington DC, to participate in a study investigating gaming habits, personality, and emotions. Approximately 100 individuals like me may participate in the study.

b. If I decide to participate, I will be asked to complete a packet of questionnaires concerning gaming habits, personality, and emotions. My participation today will take approximately 30 minutes.

c. This study involves minimal risk, but there may be some discomfort in answering questions. I may skip questions if I wish or stop my participation at any time. If I experience significant distress because of this study, I should contact the Crisis Hotline at 1-800-273-8255.

d. There is not likely to be any benefit for my participation in this study, aside from being entered into a drawing for the chance to win a $60 Amazon gift card.

e. This study is confidential. The information obtained during this study will be will be identified with only my Xbox Live ID.

f. My participation in this study is voluntary. I may omit all items, or only fill out the items I am comfortable with at my own discretion. There will be no record kept of the extent of my participation. My decision whether or not to participate will not prejudice my future relations with the researcher or the research's institution – Argosy University. I am free to discontinue participation at any time.

g. I am entitled to a summary of the results of the research. I may contact Kelli Dunlap at (202) 489-9844 or kelli.dunlap117@gmail.com to request a copy.

h. This research has been certified by the Argosy University, Washington DC Institutional Review Board (IRB) for the period February 11, 2012, to February 10, 2013. To clarify my rights as a research participant or to discuss injury arising from the study, I may contact the IRB Chair, Dr. Edward Shearin, at (703) 526-5811 or eshearin@argosy.edu.

i. If I have any questions about the research, I may contact the researcher, Kelli Dunlap, at (202) 489-9844 or kelli.dunlap117@gmail.com. I may also contact the research supervisor, Dr. Jim Sexton, at (703) 526-5884 or jesexton@argosy.edu.

j. I should print a copy of this form to keep for my records.

I am making a decision as to whether or not to participate. Checking the "I consent" box indicates that I have read the information provided above. Proceeding to the questionnaires indicates that I am giving my consent to participate in this study. I may withdraw at any time without prejudice after endorsing this form should I choose to discontinue participation in this study.

☐ I consent.

APPENDIX C

**Recruitment Post**

There are many misconceptions out there about gamers and gaming and by participating in this study you will be helping science to separate the myths from the facts; the cake from the lie.

Participants who complete the initial survey will be entered into a random drawing for a $60 Amazon.com gift card.
In order to participate in this study, you will need to:

- Be 18 years of age or older
- Have access to
    - A gaming console (i.e. Xbox 360, PS3, Wii)
    - Your own online handle (such as an XBL gamertag or PSN ID)
    - Online gaming account (i.e., Xbox Live Gold)
- A Raptr account
    - If you do not currently have a Raptr account, you can sign up for one here.

Participants will be asked to sign an informed consent form, complete a questionnaire - which will take between 20 and 30 minutes - and to share their Raptr account username. That's it!

After 30 days, participants will be asked to fill out a follow-up survey. If you complete the follow up survey, you will earn a second entry into the drawing.

All information provided by the participant will be kept strictly confidential and participants may terminate their participation in this study at any time, for any reason, without punishment or reprisal.

If you meet the requirements listed above and are ready to get started, click here.

If you have any questions, concerns or comments, please feel free to email me at: kelli.dunlap117@gmail.com

Thank you!

Kelli Dunlap