

The Effect of Violent Video Game Play, Arousal, and Personality on Sleep Quality

by

Mallory Stankovich

**A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science
(Psychology)
in the University of Michigan-Dearborn
2018**

Master's Thesis Committee:

**Associate Professor Arlo Clark-Foos, Co-Chair
Associate Professor Michelle Leonard, Co-Chair**

To everyone who supported me through this process, thank you.

Table of Contents

Dedication	i
List of Tables	ii
List of Appendices.....	iii
Abstract.....	iv
Chapter I: Introduction and Literature Review	1
Video Games	1
Sleep	2
Violent Video Games	6
Physiological Arousal	7
Motivations and Personality.....	8
Personality and Sleep Quality	9
Chapter II: Hypotheses	11
Chapter III: Method	14
Chapter IV: Procedure.....	16
Chapter V: Measures.....	18
Chapter VI: Results	22
Chapter VII: Discussion.....	28
Chapter VIII: References.....	36

List of Tables

Table 1: Average Level of Video Game Violence.....	40
Table 2: Three Stage Hierarchical Regression Analysis between Gamer Type, Average Change in Arousal, Personality, and Sleep Quality.....	41
Table 3: Correlation Analyses between Overall Sleep Quality, Gamer Type, and Average Change in Arousal.....	42
Table 4: Correlation Analyses between Overall Sleep Quality and Video Game Playing Motivations	43
Table 5: Correlation Analyses between Overall Sleep Quality and Personality Factors.....	44

List of Appendices

Appendix A: List of Favorite / Most Played.....45
Appendix B: Demographic Questionnaire.....46
Appendix C: Diary.....48

Abstract

Video games have become exponentially popular over the past few decades. Because they have become a societal staple, research has explored possible ways in which video games could affect one's health. In particular, video games may impact sleep, leading to poor sleep quality (Adam, Snell, & Pendry, 2007), later sleep on-set (King et al., 2013), and increased daytime sleepiness (Van den Bulck, 2004b). Other factors, including type of video game, physiological arousal, personality, and game playing motivations may also affect overall sleep quality. In this study, 101 adult video game players wore a Fitbit for 48 hours and played console or PC video games as they normally would. A two-way ANOVA, a hierarchical regression, and correlation analyses were conducted and suggest some relationships may exist among these variables. Although some analyses were nonsignificant, that could suggest adults are not playing video games in such an unhealthy manner that their sleep quality is negatively affected. Future research could examine this further.

Keywords: video games, sleep quality, arousal, personality, motivation.

VIOLENT VIDEO GAME PLAY

Chapter I: Introduction and Literature Review

Video games have garnered popularity around the world over the past few decades. Within the United States, citizens of all ages have either played video games or know someone who has played them. According to the Entertainment Software Association (ESA), 155 million people in the United States play video games. Gamers who play most frequently play an average of 6.5 hours per week with other players online and 5 hours per week with others in person (ESA, 2015). Regular gamers have progressively spent more time playing video games over the past three years than other activities, including watching television, going out to see a movie, and watching a movie at home (ESA, 2015). Due to the volume of players, the gaming industry has become lucrative. In 2014, the gaming industry earned \$22.41 billion in total video game sales in the United States. Video games may be played on a variety of platforms. They may be played on cell phones or tablets in the form of applications, or “apps”. They could also be played on consoles, such as XBox, PlayStation, or Nintendo Wii, as well as on a PC or Mac. Because of the increasing amount of ways to play video games, as well as the financial success of the industry, video game playing behaviors have become a viable area of research.

In the United States, 53% of adults 18 and older identify as gamers and one in five play video games daily (Lenhart et al., 2008). Additionally, 81% of adults between the ages of 18 and 29 play video games (Lenhart et al., 2008). This suggests age groups other than children and adolescents describe themselves as video game players. Education may influence video game playing as well. In particular, 76% of currently enrolled college students 18 and older report playing video games while 49% of non-students report playing video games (Lenhart et al.,

VIOLENT VIDEO GAME PLAY

2008). As a result, this may suggest that education may slightly moderate video game playing. Because of the vast number of players and the age range in which video game players may be at risk for certain health issues, research has been conducted to examine the ways in which video games may physically affect those individuals.

Sleep

Video game playing may affect various aspects of physiological health, such as sleep. Sleep is a vital and essential part of health and has important functions, such as maintaining physical and mental health, as well as providing the ability to perform daily functions including concentration, coordination, and learning (National Institute of Health, 2012). Sleep disturbance is a substantial problem in the United States. According to the National Sleep Foundation, at least “40 million Americans suffer from over 70 different sleep disorders and 60 percent of adults report having sleep problems a few nights a week or more,” (National Sleep Foundation, 1999-2004).

Because of this, sleep deprivation is an important area of concern. Research has found that sleep deprivation can affect a person psychologically, but it may also affect a person physically. According to Vgontzas et al. (2003), moderate sleep deprivation could have a significant effect on physical well-being. In their study, 12 men and 13 women, who were defined as normal sleepers, had their sleep monitored and blood sampled and analyzed based on the amount of time they were allowed to sleep. In the first four nights of the 12-day study, participants were allowed to sleep a full eight hours. During the remaining eight days, they were woken up two hours early, asked to sit in the lab and not to nap, then released to continue their daily activities. Their results showed that a modest restriction of two hours per night for one week was related to an increase in sleepiness, decrease in psychomotor skills, and an increase of

VIOLENT VIDEO GAME PLAY

proinflammatory cytokines such as interleukin-6 and tumor necrosis factor alpha (Vgontzas et al., 2003). The influx of these proteins can have a negative effect on the body, and their results express how these proteins may have significant physical effects moderate sleep deprivation may have on the body. Consistent with this research, severe sleep deprivation can also have significant effects on the body.

Sleep quality is one factor that may be related to sleep deprivation. Sleep quality is a characteristic of insomnia that may lead a person to have trouble falling asleep or staying asleep (American Psychiatric Association, 2013). Various definitions have been used to attempt accurately depicting what constitutes sleep quality. In a study conducted by Harvey et al. (2008), participants defined sleep quality by feelings of tiredness upon waking and throughout the day, feelings of restfulness upon waking, and amount of times one has awoken throughout the night. With this definition in place, sleep quality's effect on physiological and psychological health could be explored. The ways in which video games could affect sleep quality could be an important area of research, which is what this study aimed to examine.

Past researchers delved into this area, examining the effects video games have on sleep quality. Adam, Snell, & Pendry (2007) examined this link through diaries written by 2,454 children and adolescents that described their daily activities and how much time they spent on each one. The results suggest that children and adolescents who played video games before bedtime or at night were more likely to have later bedtimes than participants who did not play video games before bedtime, resulting in poorer sleep quality (Adam, Snell, & Pendry, 2007). Because of this, children and adolescents who play video games before going to bed may be more likely to prolong when they go to sleep, which may, in turn, affect their sleep quality. This idea was further explored in a study conducted by Eggermont and Van den Bulck (2006). In that

VIOLENT VIDEO GAME PLAY

study, researchers examined the ways in which adolescents used various forms of media as a sleep aid. The forms of media included television, music, and computer games, and the use of these forms of media were compared to reading a book to help participants fall asleep. The study consisted of 2,546 middle and high school students across 15 different schools. The results suggest 36.7% of participants watched television to help them fall asleep. Music was used by 60.2% of participants to aid in falling asleep. Additionally, 28.2% of male participants and 14.7% of female participants reported playing computer games to help them fall asleep. The results further suggest that participants who used media to fall asleep reported higher levels of tiredness, later bedtimes throughout the week, and fewer hours of sleep per week than participants who read books to help them fall asleep or participants did not use any form of media as a sleep aid (Eggermont & Van den Bulck, 2006). Participants who played computer games or used other media were more likely to get fewer hours of sleep and feel more tired than those who did not utilize those media before bed. These results further suggest a possible negative relationship between using media, such as video games, and sleep quality.

Later sleep-onset frequency may also be related to playing video games close to bedtime or at night, possibly impacting sleep quality (King et al., 2013). In their study, King, Gradisar, Drummond, Lovato, Wessel, Micic, Douglas, and Delfabbro (2013) examined short term violent video game exposure on sleep quality. Adolescent participants played a violent video game either 50 or 150 minutes before their typical bedtime for two nights while in a sleep laboratory. Their results suggest sleep-onset latency increased by an average of 17 minutes for participants who had prolonged playing time rather than regular gaming time. Additionally, sleep quality seemed to be affected, with participants reporting poorer sleep quality after prolonged gaming than regular gaming (King et al., 2013). As these results suggest, adolescents who

VIOLENT VIDEO GAME PLAY

play violent video games, especially before bedtime, may have poorer sleep quality, later sleep onset, and shorter overall time asleep than those who do not play violent video games, which may negatively impact sleep quality.

In addition to later sleep-onset frequency, Van den Bulck (2004b) suggests late night video game playing may be related to daytime sleepiness. In a sample of 2,546 children from 15 different elementary schools in Flanders, Belgium, participants completed questionnaires that assessed what types of media were present in their bedrooms, hours of television watched, computer game playing, video game playing, internet use, average bedtime and waking time on weekdays and weekends, and general sleepiness throughout the day. According to the results, children who had a computer in their rooms and who played computer games more than watched television had later bedtimes on weekdays and weekends, woke up later on weekends, spent less time in bed on weekdays, and reported high levels of daytime sleepiness (Van den Bulck, 2004b). This suggests playing video games on a computer may negatively impact sleep quality and positively affect daytime sleepiness.

Although the possible relationship between poor sleep quality and video games has been researched in children and adolescents, the literature on this topic for adults is sparse. Because children and adolescents are typically considered the target audience for video games, most research has been focused on the effects of video games within this population. A study conducted by Exelmans and Van den Bulck (2014) aimed to add to the literature and explore the relationship between sleep quality and video game playing in an adult population. Face-to-face interviews and questionnaires were utilized to examine if video game volume was related to sleep quality. The study consisted of 844 participants (56.2% female) aged 18-94 who completed the Pittsburgh Sleep Quality Index (PSQI) to measure subjective sleep quality and described how

VIOLENT VIDEO GAME PLAY

often video games were played on weekdays and weekends. The results suggest video game volume was a significant predictor of sleep quality, fatigue, insomnia, bedtime, and rise time (Exelmans & Van den Bulck, 2014). Additionally, gaming volume appeared to predict sleep latency, sleep efficiency, and the use of sleep aid medication (Exelmans & Van den Bulck, 2014). As the results suggest, video games may also affect sleep quality in adults.

Violent Video Games

One type of video games that may affect sleep quality is violent video games. These types of games have been studied extensively in child and adolescent populations. The majority of the research focuses on how violent video games may lead to aggressive behavior, especially in boys (Willenz, 2002). Exposure to violent video games may also predispose one to the possibility of developing conduct disorder (Paturel, 2014) and entice them to imitate behaviors they view in the games (Herpertz et al., 2005).

Although the literature is not as extensive for violent video games' effect on sleep as the literature for their effect on aggressive behavior, a few studies have explored this possible relationship. In a study conducted by King, Gradisar, Drummond, Lovato, Wessel, Micic, Douglas, and Delfabbro (2013), the prolonged effects of short term violent video game play were examined. A total of 17 adolescent males with no prior sleep disturbances played a violent video game for 50 or 150 minutes before their typical bedtime for two days. Sleep and heart rate were measured using polysomnography, and a diary was used to assess subjective arousal after game play each night. The results suggested prolonged violent video game play decreased sleep efficiency by 7 ± 2 minutes and decreased total sleep time by 27 ± 12 minutes. In addition, subjective reported sleep onset increased by 17 ± 8 minutes, and sleep quality decreased after prolonged gaming (King et al., 2012). These results suggest a relationship between violent video

VIOLENT VIDEO GAME PLAY

games and sleep quality, with violent video games negatively affecting various aspects of sleep quality.

Physiological Arousal

In addition to sleep quality, violent video games may also affect physiological arousal. Anderson and Bushman (2001) conducted a meta-analysis of video game research in *PsychINFO* through the year 2000 that examined the effect of violent video game playing on state arousal and prosocial behavior. Their criteria included searching for the following terms: (*video** or *arcade* or *computer*) and (*game**) and (*attack** or *fight** or *violen** or *hostil** or *ang** or *arous** or *prosocial* or *help**). The researchers included 35 studies with 54 independent samples for a total of 4,262 participants. The results of the meta-analysis suggested that video games may be linked to higher levels of arousal, as displayed through increased heart rate, systolic blood pressure, and diastolic blood pressure (Anderson & Bushman, 2001). These results support their hypotheses, suggesting violent video games could have an effect on one's physical health. Arriaga, Esteves, Carniero, and Monteiro (2006) also found similar results in their study in which participants between 18 and 25 years old had heart rate and skin conductance measured while they played violent video games. Their results suggest playing violent video games may increase the player's heart rate (Arriaga et al., 2006). Although these two studies examined if violent video games increase physiological arousal, they did not explore why this may have occurred.

Ballard and Wiest (1996) studied whether levels of violence within violent video games may affect physiological arousal in gamers. In their study, they had participants play one of three games: billiards, a less violent version of *Mortal Kombat*, or a more violent version of *Mortal Kombat*. Systolic and diastolic blood pressure were taken using a blood pressure cuff on the

VIOLENT VIDEO GAME PLAY

participant's nondominant arm. A baseline reading was taken before the game and a final measure was taken immediately upon completion of the game. In addition, heart rate was measured at baseline and upon completion using an automatic electro-sphygmomanometer. As the results suggest, the more violence present in a video game, the higher their cardiovascular reactivity may be (Ballard & Wiest, 1996). Participants who played the billiards game had the lowest systolic blood pressure, diastolic blood pressure, and heart rate compared to both levels of the Mortal Kombat game. The more violent version of Mortal Kombat had the highest systolic blood pressure, diastolic blood pressure, and heart rate compared to the less violent version of Mortal Kombat and the billiards game (Ballard & Wiest, 1996). Ballard and Wiest (1996) suggest that violent video games may increase a player's arousal due to the active participation required for the game. They also propose this increase in physiological arousal may not be limited to violent video games but may also be applicable to action-related games.

Motivations and Personality

Past research has also analyzed possible motivations for video game playing. Sherry, Greenberg, Lucas, and Lachlan (2006) identified six dimensions for video game play: Arousal, Challenge, Competition, Diversion, Fantasy, and Social Interaction. Three focus groups (Video Game Player, Non-Video Game Player, and Mixed or Non-Player) completed surveys and interviews which examined their primary reasons for playing video games. Analyses of their responses yielded these previous six categories mentioned, providing a possible framework for understanding and identifying motivations for playing video games.

Personality may be an additional motivation for video game play, including preference for violent or nonviolent video games. Chory and Goodboy (2011) measured personality factors to explore which ones may be related to violent video game playing. Their results suggest violent

VIOLENT VIDEO GAME PLAY

video game preference seems to be associated with participants who are high in openness and low in agreeableness, as well as participants high in openness and extraversion but low in agreeableness and neuroticism. Ozturk, Bektas, Ayar, Ozguven Oztornaci, and Yagci (2015) also found that participants high in openness and extraversion were more likely to play video games online and have internet addiction than participants low in these personality factors.

Graham and Gosling (2013) and Worth and Book (2014) have found links between extraversion and video game play, with extraverted individuals focusing on the social and communication elements of game play. In addition, social motivation for video game playing, particularly in online role playing games, may be linked to high agreeableness, neuroticism, and openness (Graham & Gosling, 2013). Openness was also found to be high in regular gamers (Teng, 2008; Tuten and Bosnjak, 2001; Witt et al, 2011), violent video game players (Chory & Goodboy, 2011), and in role-playing gamers (Graham and Gosling, 2013). Chory and Goodboy (2011) suggest violent video game players were low in agreeableness. Research has also suggested that conscientiousness may be positively linked to video game play (Teng, 2008), but the research is not concrete. Because the research is mixed, additional research may be valuable to illuminate possible relationships between personality, motivational factors, and violent video game play.

Personality and Sleep Quality

Further research suggests certain personality traits may be linked to sleep quality. Kanno, Tsugawa, and Yoda (2014) explored the link between the Big Five personality traits and sleep quality. Using the PSQI and the NEO-Five Factor Inventory, results suggest a significant correlation between neuroticism and subjective sleep quality, sleep disturbances, daytime dysfunction, and the overall sleep quality score (Kanno et al., 2014). Neuroticism was the only

VIOLENT VIDEO GAME PLAY

personality trait significantly correlated with sleep quality, suggesting neuroticism may be the most significant personality trait tied to sleep quality. Huang, Peck, Mallya, Lupien, and Fiocco (2016) also examined a possible link between sleep quality and personality traits. In their study, researchers also used the PSQI and NEO-Five Factor Inventory to examine personality traits and their possible relationship to sleep quality. Their research suggests high neuroticism and low conscientiousness may be significantly linked to poor sleep quality (Huang et al., 2016).

In a study examining a possible link between personality traits and sleep quality in young Korean women, Kim et al. (2015) also suggest a link between neuroticism, conscientiousness, and poor sleep quality. Their research suggests neuroticism significantly contributes to the overall sleep quality score of the PSQI, possibly linking high neuroticism to poor sleep quality (Kim et al., 2015). Their results also suggest participants high in conscientiousness may be less likely to have poor sleep quality, possibly allowing high conscientiousness to be a protective factor against poor sleep quality (Kim et al., 2015).

Because video games are prevalent, expanding the literature on them may be beneficial. Past research has suggested links between video games, sleep quality, change in arousal, and personality. The past research has examined these effects in children and adolescents, leaving research on adult populations subject to exploration. The present study focuses on examining the effects of video games, state arousal, and personality factors on sleep quality in a population of adult video game players.

Chapter II: Hypotheses

In this study, the hypotheses expected to replicate findings from previous research conducted with children and adolescents in an adult population. Additionally, this study intended to explore new findings, as presented in hypothesis four, examining the combined effects of the three main variables on sleep quality in adult video game players.

Hypothesis One

The first hypothesis the study aimed to test was that sleep is related to video game play. Participants who play violent video games were expected to have poorer sleep quality than participants who play nonviolent video games.

Hypothesis Two

In addition, this study hypothesized that sleep was related to arousal. Participants who had a high change in arousal were expected to have poorer sleep quality than participants who had low change in arousal.

Hypothesis Three

Additionally, video game playing may have been related to arousal. Participants who preferred violent video games were expected to have higher change in arousal than participants who had a preference for nonviolent video games.

Hypothesis Four

Sleep quality, video game playing, and arousal were expected to be interrelated. Participants who had high change in arousal and played violent video games were expected to

VIOLENT VIDEO GAME PLAY

have poorer sleep quality than participants with low change in arousal and played nonviolent video games.

Hypothesis Five

Personality was also expected to have an effect on sleep, change in arousal, game type, and motivations.

1. Neuroticism

It was expected that participants high in neuroticism would have higher change in arousal than participants low in neuroticism, play violent video games more often than nonviolent video games, were motivated to play video games for competition and fantasy-arousal elements, and have poorer sleep quality than participants low in neuroticism.

2. Extraversion

Participants high in extraversion were expected to have higher change in arousal than participants low in extraversion, play violent video games more often than nonviolent video games, were motivated to play video games competition and social interaction, and have poorer sleep quality than participants low in extraversion.

3. Openness

Participants high in openness were expected to have higher change in arousal than participants low in openness, play violent video games more often than nonviolent video games, were motivated to play video games for diversion and fantasy-arousal elements, and have poorer sleep quality than participants low in openness.

4. Agreeableness

Participants low in agreeableness were expected to have higher change in arousal than participants high in agreeableness, play violent video games more often than nonviolent video

VIOLENT VIDEO GAME PLAY

games, were motivated to play video games for motivation and challenge, and have poorer sleep quality than participants high in agreeableness.

5. Conscientiousness

Participants high in conscientiousness were expected to have higher change in arousal than participants low in conscientiousness, play violent video games more often than nonviolent video games, were motivated to play video games for competition and challenge, and have poorer sleep quality than participants low in conscientiousness.

Chapter III: Method

Participants

Participants were 82 males and 19 females ages 18 and older. The participants were recruited from the Introductory Psychology subject pool via SONA at the University of Michigan-Dearborn, throughout the campus, and from social media sites, including Facebook. There were 74 participants from the subject pool and 27 from outside of subject pool. For the subject pool participants, the study was posted to the homepage of SONA, the psychology subject pool website, in which Introductory Psychology student participants read the description and decided whether or not to participate. From that point, students read about the study and if they signed up, they chose a time to come into Dr. Arlo Clark-Foos' lab to complete the questionnaires and receive the activity tracker and diary. Any Introductory Psychology student 18 years and older who needed to complete a study during the Winter, Summer, or Fall semester of 2017 had the opportunity to participate. Students in Subject Pool who signed up for the study received two research credit through the Subject Pool Administrator.

Non-subject pool participants also completed this study. These included students in behavioral sciences classes, students at the University of Michigan-Dearborn, or community members of Southeast Michigan. They were informed through flyers posted around the University of Michigan-Dearborn campus, an email to professors to make an announcement about the study in their classes, and through social media, including Facebook. On Facebook, a post was made to the PI's wall with a scanned copy of the flyer, asking potential participants to email the PI if they were interested in participating in the study. They were asked to directly

VIOLENT VIDEO GAME PLAY

email the PI, not “like” or “comment” on the post. Non-subject pool participants emailed the PI, who were asked if they play PC or console video games at least once per week. If they answered "yes," they were provided available times to come into the lab to participate in the study. If they answered "no," they were thanked for their interest, but were not able to participate in the study.

Non-subject pool participants had the option to choose to enter their name into a lottery for a chance to win a \$25 Amazon gift card. There was a Time 1, Time 2, and Time 3 lottery. After 10 participants were entered in one of these lotteries, a name was drawn, and the winner notified. Names not chosen for that drawing were removed and a new lottery began until the next 10 participants were entered. If a selected participant winner did not respond to claim their prize after three contact attempts in a 20-day period, another winner would be selected in their place from that original pool of participants. If they were enrolled in a behavioral science class and their professor was willing to provide extra credit for participation in the study, that option may have been chosen. Participants could only choose one, the lottery for the gift card or extra credit, not both. Additionally, subject pool participants could also have chosen to enter their name in the lottery or obtain extra credit if their professor was willing to provide it for participation in the study instead of subject pool credit. They were only allowed to pick one option: subject pool credit, the lottery for the gift card, or extra credit, not all three.

Chapter IV: Procedure

For subject pool participants, this study was available through SONA. Before signing up for the study, participants answered one prescreen question, which was, "Do you play video games at least once per week?" If the participant answered "no," he or she will be directed to an exit screen. If the participant answered "yes," he or she was directed to sign up for an available time slot. Non-subject pool participants were asked the same question via email before they were provided a list of available time slots.

Upon arrival to the lab, participants were provided a consent form. The participants read the consent document which contains all aspects of informed consent including what was asked of them should they choose to participate in the study. The researchers went over the information within the consent form with the participants and answered any questions. If they wished to continue, they signed the consent form and were provided the questionnaires. Those who did not wish to participate were thanked for their time and exited the lab.

Each participant selected two time slots: one to complete the consent form, questionnaires, and receive study materials and another time to return materials, complete demographic information, and receive the debriefing form. If participants withdrew from the research prior to completing the study, they would receive credit for the amount of days in which they participated. For example, if a participant stayed in the study for one day before withdrawing, he or she would receive one credit. However, the credit would only be awarded once the Fitbit and arousal diary had been returned to the researcher, whether returned in person

VIOLENT VIDEO GAME PLAY

to the researcher or returned to either of the faculty advisors. They could also contact the Behavioral Sciences office to return their materials to either of the faculty advisors' mailboxes.

Participants arrived at the lab at their first scheduled time. Upon arrival, participants completed a consent form with pen or pencil with their name, professor, and course number in order to assign credit. Those who did not wish to participate will be allowed to exit the study. Once informed consent is received, participants completed the Big Five Inventory-10, PSQI, Motivations for Game Use Scale, and List of Favorite Games / Most Played Games with pen or pencil. Participants were then be instructed on how to use the Fitbit Charge HR, including care such as not submerging the activity tracker in water. Participants were also provided with the paper arousal diary to log video game playing over the course of 48 hours with pen or pencil.

At the end of 48 hours, participants returned to the lab at their second scheduled time. They returned the Fitbit Charge HR and completed arousal diary, filled out the demographic questionnaire, then received a debriefing form, explaining the true purpose of the study. They were also be provided a list of referrals for counseling, sleep clinics, and sleep-related hotlines. Participants were asked if they had any questions and thanked for their time.

Chapter V: Measures

Big Five Inventory-10

Participants completed the Big Five Inventory-10. The Big Five Inventory-10 (BFI-10; Rammstedt & John, 2007) is a shortened version of the Big Five Inventory-44. This 10-item inventory measures the Big Five personality dimensions using a 5-point Likert scale ranging from 1 (disagree strongly) to 5 (agree strongly). There are two questions on the measure that pertain to each personality dimension. Participants were asked to respond to each question as to how strongly they agree with the statement provided, with participants who agree strongly with items pertaining to certain personality factors suggesting the participant was likely to have that personality type. The alphas for each personality factor are as follows: extraversion: .85, agreeableness: .74, conscientiousness: .83, neuroticism: .79, and openness: .74. The mean alpha for this scale is .79.

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI) measures sleep quality in adult populations (Buysse et al., 1989). This 9-item instrument measures sleep quality for the past month across seven sleep-related areas: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. The scores of each section are calculated individually and summed to create a global score, indicating overall sleep quality. Scores under “5” indicate good sleep quality while scores over “5” indicate poor sleep quality. The alpha for this measure for this study is .71.

VIOLENT VIDEO GAME PLAY

Motivations for Video Game Use Scale

Participants were then asked to complete the Motivations for Video Game Use Scale (Nije Bijvank, Konijn, & Bushman, 2012). This scale examines motivations for playing one's preferred video games. This scale begins with the statement "I play my favorite game because..." and follows with 22 items that complete the statement. Participants were asked to rate on a 7-point Likert scale how strongly they agree with the statements, ranging from 1 (disagree completely) to 7 (agree completely). Answers were summed and examined how heavily they load onto seven possible factors: Social Interaction, Competition, Escape, Excitement, Unwind, Challenge, and Diversion. Participants whose responses loaded highly onto one or more of these dimensions may have indicated possible reasons for playing certain games. The alpha for this measure for this study is .79.

List of Favorite Games / Most Played

Upon completion of the previous scale, participants were asked a brief series of questions based on their favorite games. Participants listed their top three favorite games and indicated the level of violence of each game on a 7-point Likert scale ranging from 1 (no violence) to 7 (extreme violence) (see Appendix A). As seen in Table 1 in the Appendix, an average of the level of violence for all three games was summed and used to determine whether the participant preferred violent or nonviolent games. Scores ranged from 3 to 21, with scores between 3 and 11 indicating "nonviolent game preference" and scores between 12 and 21 indicating "violent game preference". This measure was modeled after a similar measure in Anderson and Dill's (2000) study and was created for this study.

Demographic Questionnaire

VIOLENT VIDEO GAME PLAY

Participants were asked a series of demographic questions. These included stating one's age, gender, education level (High School Degree, Associate's Degree, Bachelor's Degree, Master's Degree, Doctorate, Other), race, and video game play information, including where one plays video games, how often one plays video game (days per week), whether one plays alone or with others, whether one plays with others alone or online, and where one typically plays video games (see Appendix B).

Diary

Each participant was provided an eight-page diary to keep track of video game play, which contained information regarding video games played and subjective state arousal. Participants provided the title of the game played, start time, and indicated their arousal level by circling a number, one through nine, that corresponds to one of five faces on the SAM arousal scale (Bradley & Lange, 1994), ranging from low arousal to high arousal, before beginning the game. They indicated the time in which they stopped playing the game and the level of arousal they felt upon ending the game (see Appendix C). Participants completed this process each time they played a console or computer-based game over the course of 48 hours. At the end of the 48 hours, participants returned the diary to the researcher.

Activity Tracker

Participants received a Fitbit Charge HR activity tracker. The activity tracker measured each participant's heart rate throughout regular game play and sleep duration over the course of 48 hours. The heart rate information was used to examine change in arousal before and after playing video games. Additionally, the sleep data that was collected was sleep duration and sleep and wake time to determine hours of sleep participants obtained each night. Every Fitbit was numbered, and each participant had a corresponding number to the Fitbit to which they are

VIOLENT VIDEO GAME PLAY

assigned. For example, the first participant with Fitbit 1 was assigned the number 101. The first participant with Fitbit 2 was assigned the number 201, etc. Each numbered Fitbit had its own free online account that was accessed through the Fitbit home web page, which was only be accessible to the researcher. The data for each participant was downloaded into an Excel file. Additionally, the Fitbit data was linked to each participant based on their numbered Fitbit and the days in which they completed the study. For example, if the first participant who had Fitbit 1 completed the study 2/1-2/3, that data set was linked to participant number 101, which will also be written on their questionnaires for the first day of the study as well as the last questionnaire on the last day of their participation. Because each numbered Fitbit was assigned to one person at a time, we were able to easily connect the data for each participant across the two days. Credit was assigned to participants who had returned their Fitbit. The number of the Fitbit that each participant borrowed was written on their release form once they had signed the form. Once the Fitbit had been returned, the researcher wrote “returned” on the participant’s release form and assigned credit to the participant whose name is on the form. Participant numbers were only on their questionnaires, diary, and Fitbit data, not on their consent form nor their release form.

VIOLENT VIDEO GAME PLAY

Chapter VI: Results

Participants were 82 males (81.2%) and 19 females, aged between 18 and 32. Of these participants, 66 (65.3%) were violent video game players while 35 (34.7%) were nonviolent video game players. Overall sleep quality results suggested the majority of the sample had poor sleep quality, with 55 participants (54.5%) indicating they had poor sleep quality while 46 participants expressed they had good sleep quality. In terms of education, 80 participants (79.2%) had a high school diploma or GED. Additionally, 9 participants (8.9%) had an Associate's degree, 10 participants (9.9%) had a Bachelor's degree, and 2 participants (2.0%) had other education that was not listed. Of these participants, slightly over half (54.5%) were Caucasian. The remaining half identified as Arabic or Middle Easterner (17.8%), African American / Black (9.9%), Asian or Pacific Islander (7.9%), Hispanic (3.0%), Indian (3.0%) Native American / American Indian (1.0%), and other (3.0%).

Regarding video game playing, 49 participants (48.5%) play video games with others, 28 participants (27.7%) play alone, and 24 participants play both alone and with others. In terms of gameplay, 36 participants (35.6%) play video games online, 31 participants (30.7%) play with others in person, 18 participants (17.8%) play with others both in person and online, 9 participants (8.9%) play alone, and 7 participants play video games alone, in person with others, and online with others. In addition, 21.8% of participants play video games four days per week, 20.8% play three days per week, 17.8% play seven days per week, 9.9% play six days per week, 9.9% play two days per week, and 6.9% play once a week. Results from list of favorite / most

VIOLENT VIDEO GAME PLAY

played video games suggest the top five favorite or most played video games are: League of Legends, Overwatch, NBA 2K17, Grand Theft Auto V, and Rocket League.

Results from the Big Five Inventory-10 suggest the majority of the sample was high in agreeableness, with 95 participants (94%) identifying as such. In terms of extraversion, 62 participants (61.4%) identified as high in extraversion while 39 participants identified as low in extraversion. For conscientiousness, 40 participants (39.6%) were high in conscientiousness while 61 participants were low in conscientiousness. In regard to neuroticism, 67 participants (66.3%) identified as high in neuroticism while 34 participants identified as low in neuroticism. Finally, 37 participants (36.6%) were high in openness and 64 participants were low in openness.

Hypothesis One

A two-way ANOVA was conducted to examine the influence of gamer type on overall sleep quality. Gamer type consisted of two levels (violent video game player, nonviolent video game player), and sleep quality was continuous. This analysis was utilized to compare the main effect of gamer type on overall sleep quality. Contrary to predictions, the main effect for gamer type was not statistically significant, $F(2,90) = 1.082, p = ns$.

Hypothesis Two

A two-way ANOVA was conducted to examine the influence of average arousal change on overall sleep quality. Average arousal change consisted of three levels (positive change, negative change, no change), and sleep quality was continuous. This analysis was utilized to compare the main effect of average arousal change on overall sleep quality. Contrary to predictions, the main effect for average arousal change was also not significant, $F(2,90) = .408, p = ns$.

VIOLENT VIDEO GAME PLAY

Hypothesis Three

A correlation analysis, as seen in Table 3, was conducted to examine the influence of gamer type on average arousal change. Gamer type consisted of two levels (violent video game player, nonviolent video game player), and average arousal change consisted of three levels (positive change, negative change, no change). This analysis was utilized to compare the main effect of gamer type on average arousal change. Contrary to predictions, the main effect for gamer type on arousal change was not statistically significant, ($r = -.029, p = ns$).

Hypothesis Four

A two-way ANOVA was conducted to examine the influence of two independent variables (gamer type, average arousal change) on overall sleep quality. Gamer type consisted of two levels (violent video game player, nonviolent video game player), average arousal change consisted of three levels (positive change, negative change, no change), and sleep quality was continuous. This analysis was utilized to compare the interaction between gamer type and average arousal change on overall sleep quality. Contrary to predictions, the interaction between gamer type and average arousal change was not significant, $F(1,90) = .970, p = ns$.

Hypothesis Five

A three-stage hierarchical regression was conducted with sleep quality as the dependent variable. Gamer type was entered at stage one, average change in arousal was entered at stage two, and personality variables (extraversion, neuroticism, openness, agreeableness, and conscientiousness) were added at stage three. As seen in Table 2 in the Appendix, the hierarchical regression revealed that at stage one, gamer type accounted for .8% of the variance of overall sleep quality, but not significantly contribute to the regression model, $R^2 = .008, F(1,94) = .736, p = ns$. Adding average change in arousal in stage two explained an additional

VIOLENT VIDEO GAME PLAY

.5% of the variance, but was not significant, $R^2 = .005$, $F(2,93) = .479$, $p = ns$. In stage three, the five personality factors together explained an additional 12% of the variance of overall sleep quality and was significant, $R^2 = .120$, $F(7,88) = 2.428$, $p < .05$. Within this stage, neuroticism was a significant individual predictor of overall sleep quality, $t = -2.793$, $p < .05$.

Conscientiousness was a marginally significant individual predictor of overall sleep quality, $t = -1.809$, $p = .074$. Once all the variables were included in stage three of the regression model, the overall model was marginally significant, $F(7,88) = 1.921$, $p = .076$. Together, the variables accounted for 13.3% of the variance in overall sleep quality.

Correlation analyses were also utilized to examine relationships between overall sleep quality with the following variables: gamer type (violent or nonviolent) and average change in arousal in Table 3, personality (openness, agreeableness, neuroticism, extraversion, conscientiousness) in Table 4, and video game playing motivation (social interaction, competition, challenge, fantasy-arousal, fantasy-escape, to unwind, and diversion) in Table 5 in the Appendix. Sleep quality was significantly and negatively correlated with neuroticism, ($r = -.214$, $p < .05$). Participants who were high in neuroticism were more likely to have poor sleep quality. Additionally, sleep quality was significantly and positively correlated with unwind motivation, ($r = .239$, $p < .05$). Participants who had good sleep quality were more likely to be motivated to play video games to unwind.

Average change in arousal was also significantly correlated to a personality and motivation factor. Average change in arousal was significantly and negatively correlated with conscientiousness, ($r = -.212$, $p < .05$). Participants who were highly conscientious had low change in arousal. The participants' average change in arousal was also significantly and negatively correlated with diversion, ($r = -.226$, $p < .05$). Participants who had high change in

VIOLENT VIDEO GAME PLAY

arousal were more likely to play video games for fun than participants with low change in arousal.

Various personality factors also had significant correlations. Agreeableness was significantly and positively correlated with neuroticism, ($r = .231, p < .05$). Participants who were high in agreeableness were likely to be high in neuroticism. Agreeableness was also significantly and positively correlated with fantasy-arousal motivation, ($r = .201, p < .05$). Participants who were high in agreeableness were likely to have high fantasy-arousal motivation.

Conscientiousness was significantly and positively correlated with diversion motivation, ($r = .327, p < .05$). Those who were highly conscientious were more likely to play video games for fun than those who were not highly conscientious. In addition, conscientiousness was significantly and negatively correlated with neuroticism, ($r = -.237, p < .05$). Participants high in conscientiousness were likely to be low in neuroticism.

In addition to personality factors, motivational factors resulted in a multitude of significant correlations. Competition motivation was significantly and positively correlated with unwind motivation, ($r = .244, p < .05$). Participants who were highly competitively motivated were likely to be highly motivated to play video games to unwind.

Fantasy-arousal motivation was significantly and negatively correlated with openness, ($r = -.231, p < .05$). Participants who were highly motivated to play video games for fantasy-arousal were not likely to be high in openness. Additionally, fantasy-arousal was positively and significantly correlated with fantasy-escape motivation, ($r = .354, p < .001$). Participants who are highly motivated to play video games for fantasy-arousal were also likely to be motivated to play video games for fantasy-escape elements.

VIOLENT VIDEO GAME PLAY

Finally, fantasy-escape motivation was significantly and positively correlated with unwind motivation, ($r = .297, p < .05$). Participants who were highly motivated to play video games for fantasy-escape elements were also likely to be highly motivated to play video games to unwind. Fantasy-escape motivation was also significantly and negatively correlated with neuroticism, ($r = -.267, p < .05$). Those who were motivated to play video games for fantasy-escape were less likely to be high in neuroticism than those who were not motivated to play video games for that motivation. Fantasy-escape motivation was significantly and negatively correlated with extraversion, ($r = -.207, p < .05$). Participants who were highly motivated to play video games for fantasy-escape were not likely to be high in extraversion.

Chapter VII: Discussion

Video games have a substantial presence in the United States. Over the past few decades, they have exponentially grown in popularity, which continues to grow with new games, improved graphics, and technological advances with each new console. Because of this, research has examined ways in which video games may affect one's health. One significant way in which video games could affect a person's health is sleep. This is an important area of research because sleep affects health in various ways, including increased sleepiness throughout the day, decreased psychomotor skills, and an increase of proinflammatory cytokines (Vgontzas et al., 2003), which could lead to serious health issues later in life. The majority of past research regarding video games and sleep quality has been limited to children and adolescents, leaving the literature for adult video game players sparse. Similar to the research conducted by Exelmans and Van den Bulck (2014), this study aimed to add to that literature by examining adult video game players.

Additionally, other factors related to video game playing could affect sleep quality, including physiological arousal and personality factors. Past research suggests video game playing may be associated with higher levels of arousal, which is observed through increased heart rate, systolic blood pressure, and diastolic blood pressure (Anderson & Bushman, 2001). This increased physiological arousal could also lead to diminished sleep quality, with later sleep onset and fewer hours of sleep. Personality may also be linked to sleep quality, with populations high in neuroticism possibly having poor sleep quality (Kim et al., 2015). In addition, various motivations for playing video games could influence game use and types of games played

VIOLENT VIDEO GAME PLAY

(Sherry et al., 2006). As a result, this study aimed to examine the individual and combined effects of gamer type, change in arousal, and personality on sleep quality in an adult population.

A multiple regression analysis suggested there was a marginally significant finding for predicting the combined effects for all four variables: gamer type, average change in arousal, personality, and video game motivation on sleep quality. This finding somewhat matches this study's hypothesis and past research, suggesting gamer type, average change in arousal, personality, and video game motivation have a marginal effect on overall sleep quality. Contrary to the hypothesis, the individual contributions of gamer type in stage one, average change in arousal in stage two, and video game motivation in stage four were not significant. On the other hand, the addition of personality in stage three was significant, suggesting personality had a significant contribution on sleep quality, with neuroticism significantly contributing to predicting overall sleep quality. This suggests all five of the Big Five personality traits may have an additive effect on sleep quality, with neuroticism possibly having a significant individual contribution in affecting sleep quality.

In addition to the regression analysis, correlation analyses were utilized to examine effects between the main five variables (overall sleep quality, gamer type, average change in arousal, personality, and video game playing motivation). Results suggest some correlation analyses between these variables were statistically significant. In terms of sleep quality, participants high in neuroticism were more likely to have poor sleep quality than participants with low neuroticism, which was consistent with this study's hypothesis and past research (Kanno et al., 2014). Additionally, sleep quality was significantly correlated with unwind motivation, suggesting participants with good sleep quality were also motivated to play video games to unwind. Utilizing video games to relax may have aided participants in having better

VIOLENT VIDEO GAME PLAY

sleep. Although this finding was not hypothesized, future research may be able to explore this possible relationship.

Along with sleep quality, average change in arousal was significantly correlated with a personality factor and a video game motivational factor. Conscientiousness was correlated negatively with average arousal change, suggesting participants who were highly conscientious were likely to have low change in arousal. This finding was not hypothesized, but future research could explore this relationship. Average change in arousal was also significantly correlated with diversion motivation. Participants who had high change in arousal were less likely to play video games for fun than participants with low change in arousal. This finding was also not hypothesized but may be examined in future research.

Significant correlations were also present within various personality factors. Agreeableness was significantly and positively correlated with fantasy-arousal motivation, suggesting participants who were highly agreeable were also likely to be motivated to play video games for fantasy-arousal elements, such as “it is exciting to be somewhere else,” and, “it is exciting to be someone else.” Agreeableness was also significantly and positively correlated with extraversion, suggesting participants who were highly agreeable were likely to be highly extroverted. These findings were not hypothesized, but could be explored in future research.

Like agreeableness, conscientiousness had significant correlations. Conscientiousness was significantly and negatively correlated with neuroticism. Highly conscientious participants were likely to be low in neuroticism. Conscientiousness was also significantly correlated with diversion motivation, suggesting participants high in conscientiousness were likely to be highly motivated to play video games for fun. These findings were not in the original hypotheses, but they could be examined in further studies.

VIOLENT VIDEO GAME PLAY

In addition to personality, motivational factors also expressed significant correlations. Fantasy-arousal motivation was negatively correlated with openness, suggesting participants highly motivated to play video games for fantasy-arousal elements were likely to be low in openness. Fantasy-arousal motivation was also correlated with fantasy-escape motivation. This relationship suggests participants who played video games for fantasy-arousal were likely to play video games for fantasy-escape as well. Additionally, fantasy-escape motivation was significantly and negatively correlated with extraversion. Participants who were motivated to play video games to escape reality were more likely to be introverted than extroverted. Fantasy-escape motivation was also negatively correlated with neuroticism, suggesting participants who were highly motivated to play video games to escape into a fantasy world were likely to be low in neuroticism. Fantasy-escape motivation was positively correlated with unwind motivation. This result suggests participants who were highly motivated to play video games as an escape were likely to play video games to unwind, which further research could examine the extent to which escaping reality through video games could be a form of relaxation. Unwind motivation was also positively correlated with competition motivation. Participants who were likely to play video games to unwind were likely to be motivated to play video games for competition. Although these findings were not hypothesized, further research could analyze these possible relationships.

Throughout the present study, a few limitations became apparent. The size of the sample was one limitation, which was relatively small compared to the number of participants that were needed. A larger sample could greatly impact the significance of the results, allowing the possibility for significant results to emerge. Because factors within the multiple regression model were marginally significant, a statistically significant relationship could be embedded within

VIOLENT VIDEO GAME PLAY

these variables but a larger sample size may be necessary to reveal this. Additionally, noncompliance with wearing the Fitbit for a full 48 hours was another limitation. Missing Fitbit data during the 48 hours in which a participant had the Fitbit shows noncompliance was an issue. Although participants were instructed to wear the Fitbit nonstop, except when showering, there was no possible manner to enforce this once the participants left the lab. Because of this, heart rate change data were affected, obscuring a clear physiological profile of the participants.

In addition to these limitations, participants presented various limitations upon completion of Part 2 of this study. The reason for participants having poor sleep quality may not be due to video games, but rather homework and studying during the semester may lead to poor sleep quality. Because this study utilized subject pool, most of participation occurred during the spring and fall semesters. During this time, students may stay awake later and be unable to sleep well due to stress related to class work and studying for exams. In addition, subject pool participants were scheduled during the week, not over the weekend. Multiple participants expressed that they typically do not play as many games during the week as they do on the weekend, possibly affecting sleep quality and arousal data. Additionally, participants were unable to wear the Fitbit for more than two days due to time constraints. Although each Fitbit was calibrated prior to data collection, an ideal amount of time for each person to wear the Fitbit for improved accuracy would be one week. This was a limitation since loaning Fitbits for this length of time was not feasible. Providing Fitbits for an extended period of time in future research may improve accuracy of the data.

The results may have differed from this study's hypotheses due to changes in cohorts. In previous research, the content of video games, especially violent video games, may have been reflected in the results. Violent video games may have been more novel upon initial release in

VIOLENT VIDEO GAME PLAY

the 1990s and early 2000s, but that may have changed within this decade. A multitude of video games now contain at least some violence, which may have lessened their effect on the current generation compared to the previous generation. The difference in game content is apparent since *Mortal Kombat* was the violent game of the time of Ballard and Wiest's (1996) study, whereas *Call of Duty* or *Resident Evil* are popular games in this decade, games in which violence and gore are the norm. An age shift may have also affected the data. The video games that may be more popular with the current young adults may be more violent than video games that were popular with young adults in previous research. Again, this may allow for desensitization for violent aspects of video games, which may not have had an effect on sleep quality. This may also be an explanation as to why neuroticism was not as strongly correlated with violent video game playing and overall sleep quality. People with personality traits other than neuroticism may choose to play violent video games, further suggesting a shift may have taken place among the current young adult population. Because more people may choose to play violent video games, the relationship between neuroticism and violent video games may have weakened. Additionally, regional differences may account for findings that were not aligned with this study's hypotheses. This study was conducted in Southeast Michigan, and the video game preferences in this area may be different than in other parts of the country, if not other parts of the world. Online gaming provides the opportunity to connect with people in other regions and play the same games, but not all players in this study played online or with others. Because these preferences may have been specific to this area, which may have differed from preferences for participants in other regions found in the existing literature.

Likewise, the difference between adolescent and adult populations may have affected the results of this study. As previously discussed, the majority of video game research is focused on

VIOLENT VIDEO GAME PLAY

children and adolescents, leaving adult video game research sparse. Adults in this study were college students and adults in the surrounding area. Because of this, participants could have been living alone and had been balancing classes, studying, and work, forcing them to be self-motivated more than children or adolescents. This may not have provided them ample time to play video games as they would have been able to during middle or high school. They would need to schedule playing games around classes and their workload, and they may not have had time to play like they would be able to during breaks or the summer, depending on their schedules. This could have prevented participants from staying up late to play video games, affecting their sleep quality.

Along with the difference between adolescent and adult data, the lack of playing video games in an unhealthy manner may be a reason for the lack of significance in the relationship between violent video game playing and overall sleep quality. In this age group, video game players may be playing games in a healthy manner, playing for fun and in a controlled manner. They may not be staying up as late or playing as long as children and adolescents. These adults may have adjusted their gaming to accommodate their schedules and responsibilities, possibly learning to play in a moderated and healthy manner. The lack of an effect between videogames and sleep quality may be an indication that video games are becoming less of a negative influence on one's health. In this instance, not finding an effect may not have been inherently bad.

For future research, utilizing a large, diverse sample, in terms of age, and possibly gender, could be beneficial. This may allow the data to present a more accurate profile of the general population. One may also benefit from conducting research over weekends or during the summer semesters when students may have more time to play video games. This may provide a

VIOLENT VIDEO GAME PLAY

better picture of general playing habits when participants have more time to play than during the week or during the fall and winter semesters. In addition, future research should aim to improve compliance with the Fitbits and wearing them for a longer period of time, providing the opportunity for improved accuracy of the data and overall physiological profile of each participant. Finally, future research may benefit from analyzing video game motivation relationships with personality and sleep quality. The data in this study revealed relationships between these variables that was not hypothesized, suggesting possible relationships may be present and able to be explored in the future.

The results of this study could be used for educational purposes. This may provide better insight as to whether violent or nonviolent video games have a positive or negative effect on sleep quality. This could be particularly useful within a college or university setting, since a large portion of video game players are over the age of 18. This research may also aid in reducing poor sleep quality by examining further relationships between these variables and using the findings to apply interventions to video game players who would like to improve sleep quality. This could be completed through development of treatments for insomnia or other types of sleep disorders. Additionally, this study could be used as a starting point for future research, focusing on whether or not adults do play video games in a healthy manner. Future research in this field may present possibilities for video games to aid in improving sleep quality, rather than reducing sleep quality as presented in previous research. Video games may be able to improve one's health and diminish negative stigma associated with video game playing.

Chapter VIII: References

- Adam, E.K., Snell, E.K., and Pendry, P. (2007). Sleep timing and quantity in ecological and family context: a nationally representative time-diary study. *Journal of Family Psychology, 21(1)*, 4-19. doi:10.1037/0893-3200.21.1.4.
- American Psychiatric Association. (2013). Sleep-wake disorders. In Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC.
- Anderson, C., and Bushman, B. (2001). Effects of Violent Video Games on Aggressive Behavior, Aggressive Cognition, Aggressive Affect, Physiological Arousal, and Prosocial Behavior: A Meta-Analytic Review of the Scientific Literature. *Psychological Science, 12(5)*, 353-359.
- Anderson, C., and Dill, K. (2000). Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *Journal of Personality and Social Psychology, 78(4)*, 772-790. doi:10.1037//0022-3514.78.4.772.
- Arriaga, P., Esteves, F., Carniero, P., and Monteiro, M.B. (2006). Violent computer games and their effects on state hostility and physiological arousal. *Aggressive Behavior, 32*, 358-371.
- Ballard, M., and Wiest, J. R. (1996). Mortal Kombat (™): the effects of violent video game play on males' hostility and cardiovascular responding. *Journal of Applied Social Psychology, 26(8)*, 717-730. doi:10.1111/j.1559-1816.1996.tb02740.x.
- Bosnjak, M. and Tuten, T. L. (2001). Classifying Response Behaviors in Web-based Surveys. *Journal of Computer-Mediated Communication, 6*. doi:10.1111/j.1083-6101.2001.tb00124.x
- Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: the self-assessment manikin and the semantic differential. *Journal of behavior therapy and experimental psychiatry, 25(1)*, 49-59.
- Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry research, 28(2)*, 193-213.
- Chory, R., and Goodboy, A. (2011). Is basic personality related to violent and nonviolent video game play and preferences? *Cyberpsychology Behavior and Social Networking, 14(4)*, 191-198. doi:10.1089/cyber.2010.0076

VIOLENT VIDEO GAME PLAY

- Eggermont, S. and Van den Bulck, J. (2006). Nodding off or switching off? The use of popular media as a sleep aid in secondary-school children. *Journal of Paediatrics and Child Health*, 42, 428–433. doi:10.1111/j.1440-1754.2006.00892.x.
- Entertainment Software Association. (2015, April). Essential facts about the computer and video game industry. Retrieved June 12, 2016, from <http://www.theesa.com/wp-content/uploads/2015/04/ESA-Essential-Facts-2015.pdf>.
- Exelmans, L. and Van den Bulck, J. (2014). Sleep quality is negatively related to video gaming volume in adults. *Journal of Sleep Research*, 24, 189–196. doi:10.1111/jsr.12255.
- Graham, L. T. and Gosling, S. D. (2013). Personality Profiles Associated with Different Motivations for Playing World of Warcraft. *Cyberpsychology, Behavior, and Social Networking*, 16(3). doi: 10.1089/cyber.2012.0090.
- Harvey, A.G., Stinson, K., Whitaker, K.L., Moskowitz, D., and Virk, H. (2008). The subjective meaning of sleep quality: a comparison of individuals with and without insomnia. *Sleep*, 31(3), 383-393. doi:10.1093/sleep/31.3.383.
- Herpertz, S. C., Mueller, B., Mutaz, Q., Lichterfeld, C., Konrad, K., & Herpertz-Dahlmann, B. (2005). Response to emotional stimuli in boys with conduct disorder. *American Journal of Psychiatry*, 162, 1100-1107.
- Huang, V., Peck, K., Mallya, S., Lupien, S., and Fiocco, A. (2016). Subjective sleep quality as a possible mediator in the relationship between personality traits and depressive symptoms in middle-aged adults. *PLoS ONE*, 11(6), e0157238. doi: 10.1371/journal.pone.0157238.
- Kanno, Y., Tsugawa, R., and Yoda, A. (2014). The relationship between subjective sleep quality, depression, and personality traits. *International Journal of Psychophysiology*, 94(2), 224-225. doi:10.1016/j.ijpsycho.2014.08.885
- Kim, H., Cho, J., Chang, Y., Ryu, S., Shin, H., and Kim, H. (2015). Association between personality traits and sleep quality in young korean women. *PLoS ONE*, 10(6), e0129599. doi:10.1371/journal.pone.0129599.
- King, D. L., Gradisar, M., Drummond, A., Lovato, N., Wessel, J., Micic, G., Douglas, P. and Delfabbro, P. (2013). The impact of prolonged violent video-gaming on adolescent sleep: an experimental study. *Journal of Sleep Research*, 22, 137–143. doi:10.1111/j.1365-2869.2012.01060.x.
- Lenhart, A., S. Jones and Macgill, A.R.(2008). ‘Video Games: Adults Are Players Too, Pew Internet & American Life Project, URL (retrieved 4 October 2016): <http://pewresearch.org/pubs/1048/video-games-adults-are-players-too>.
- National Institute of Health. (2012). Why is sleep important? Retrieved November 20, 2014 from

VIOLENT VIDEO GAME PLAY

the National Institute of Health: <http://www.nhlbi.nih.gov/health/health-topics/topics/sdd/why.html>.

National Sleep Foundation. (1999-2004) Retrieved November 20, 2014 from the National Sleep Foundation: <http://sleepfoundation.org/>.

Nije Bijvank, M., Konijn, E. A., & Bushman, B. J. (2012). Motivations for Video Game Use Scale. *PsycTests*, doi:10.1037/t26478-000

Öztürk, C., Bektas, M., Ayar, D., Özgüven Öztornaci, B., Yağci, D.(2015). Association of Personality Traits and Risk of Internet Addiction in Adolescents. *Asian Nursing Research*, 9(2), 120-124.

Paturel, A. (2014). Game theory: how do video games affect the developing brains of children and teens? *Neurology Now*, 10(3), 32-36.

Rammstedt, B., & John, O. P. (2007). Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. *Journal of research in Personality*, 41(1), 203-212.

Sherry, J.L., Greenberg, B.S., Lucas, K, and Lachlan, K.A. (2006). Video game uses and gratifications as predictors of use and game preference. *International Journal of Sports Marketing and Sponsorship*, Chapter 15.

Teng, C. (2008). Personality differences between online game players and non players in a student sample. *Cyberpsychology & Behavior*, 11(2), 232–234.

Van den Bulck, J. (2004b). Television viewing, computer game playing, and Internet use and self-reported time to bed and time out of bed in secondary-school children. *Sleep*, 27(1), 101-104.

Vgontzas, A. N., Zoumakis, E., Bixler, E. O., Lin, H. M., Follett, H., Kales, A., & Chrousos, G.P. (2003). Adverse Effects of Modest Sleep Restriction on Sleepiness, Performance, and Inflammatory Cytokines. *The Journal of Clinical Endocrinology & Metabolism*, 89(5), 2119-2126 doi: <http://dx.doi.org/10.1210/jc.2003-031562>.

Willenz, P. (2002). *Violent video games can increase aggression*. Washington, DC: American Psychological Association.

Witt, E. A., Massman, A. J, and Jackson, L. A. (2011). Trends in youth's videogame playing, overall computer use, and communication technology use: the impact of self-esteem and the Big Five personality factors. *Computers in Human Behavior*, 27(2), 763-769. doi:10.1016/j.chb.2010.10.025.

Worth, N. C. and Book, A. S. (2014). *Personality and behavior in a massively multiplayer online*

VIOLENT VIDEO GAME PLAY

role-playing game. *Computers in Human Behavior*, 38, 322–330.
doi:10.1016/j.chb.2014.06.009.

Yee, N., Ducheneaut, N., and Nelson, L. (2012). Online gaming motivations scale: development and validation. Paper presented at the ACM International Conference on Human Factors in Computing Systems. <http://dx.doi.org/10.1145/2207676.2208681>.

VIOLENT VIDEO GAME PLAY

Table 1

Average Level of Video Game Violence

	Mean	Standard Deviation
Violence Game 1	4.30	1.81
Violence Game 2	4.37	2.03
Violence Game 3	3.88	2.12
Avg. Total Violence	12.55	3.39

VIOLENT VIDEO GAME PLAY

Table 2

Three Stage Hierarchical Regression Analysis between Gamer Type, Average Change in Arousal, Personality, and Sleep Quality

Variable	Stage 1			Stage 2			Stage 3		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Gamer Type	.000	.051	-.088	.000	.001	-.082	.000	.000	-.064
Average Arousal Change (HR)				-.064	.092	-.072	-.046	.094	-.052
Extraversion							.173	.111	.169
Agreeableness							-.250	.230	-.112
Conscientiousness							-.190	.105	-.187*
Neuroticism							-.307	.110	-.290**
Openness							.078	.104	.077

* $p = .07$; ** $p < .05$

VIOLENT VIDEO GAME PLAY

Table 3

Correlation Analyses between Overall Sleep Quality, Gamer Type, and Average Change in Arousal

	Overall Sleep Quality	Gamer Type	Average Change in Arousal
Overall Sleep Quality	-	-.088	.151
Gamer Type	-.088	-	-.029
Average Change in Arousal	.151	-.029	-

p = *ns*.

VIOLENT VIDEO GAME PLAY

Table 4

Correlation Analyses between Overall Sleep Quality and Video Game Playing Motivations

	Overall Sleep Quality	Social	Competition	Fantasy- Escape	Fantasy- Arousal	Unwind	Challenge	Diversion
Overall Sleep Quality	-	-.023	.069	.068	-.053	.239*	-.053	-.142
Social	-.023	-	.085	.027	.178	.066	-.020	.032
Competition	.069	.085	-	.110	.059	.244*	.079	.193
Fantasy- Escape	.068	.027	.110	-	.354**	.297**	.181	.155
Fantasy- Arousal	-.053	.178	.059	.354**	-	.128	.169	-.089
Unwind	.239*	.066	.244*	.297**	.128	-	.155	.076
Challenge	-.053	-.020	.079	.181	.169	.155	-	.122
Diversion	-.142	.032	.193	.155	-.089	.076	.122	-

* $p < .05$; ** $p < .001$

VIOLENT VIDEO GAME PLAY

Table 5

Correlation Analyses between Overall Sleep Quality and Personality Factors

	Overall Sleep Quality	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Overall Sleep Quality	-	.147	-.082	-.121	-.214*	.052
Extraversion	.147	-	.231*	.019	.124	.139
Agreeableness	-.082	.231*	-	.032	-.002	.017
Conscientiousness	-.121	.019	.032	-	-.237*	-.027
Neuroticism	-.214*	.124	-.002	-.237*	-	.150
Openness	.052	.139	.017	-.027	.150	-

* $p < .05$

VIOLENT VIDEO GAME PLAY

Appendix A: List of Favorite Games / Most Played

Participant Number: _____.

Please list your top three / three favorite video games. These may be either PC or console games. Using a 7-Point Likert scale, please circle how much violence each game contains, with 1 meaning no violence and 7 meaning extreme violence.

1	2	3	4	5	6	7
No Violence	Little Violence	Some Violence	Violence	Moderate Violence	Strong Violence	Extreme Violence

Game 1:

1 2 3 4 5 6 7

Game 2:

1 2 3 4 5 6 7

Game 3:

1 2 3 4 5 6 7

VIOLENT VIDEO GAME PLAY

Appendix B: Demographic Questionnaire

Please answer the following general background questions. Please try to answer all questions. Circle the letter that corresponds with your response or fill in the blank.

1. What is your age?

Age:_____.

2. What is your gender?

- a. Male
- b. Female
- c. Other

3. What is your highest completed education?

- a. High School Diploma / GED
- b. Associate's Degree
- c. Bachelor's Degree
- d. Master's Degree
- e. Doctorate
- f. Other (please describe)

4. What is your race?

- a. African American/Black
- b. Arabic or Middle Easterner
- c. Asian or Pacific Islander

VIOLENT VIDEO GAME PLAY

- d. Caucasian/White
 - e. Hispanic
 - f. Native American/American Indian
 - g. Indian
 - h. Other (please describe)
5. How often do you play video games?
_____ Days per Week
6. Do you play video games alone or with others?
- a. Alone
 - b. With Others
7. Do you play video games with others in person or online?
- a. In person
 - b. Online
 - c. I play video games alone
8. Where do you typically play video games? Please list as many as necessary.
- _____.
 - _____.
 - _____.
 - _____.

Appendix C: Diary

Video Game Playing Behaviors Diary

Participant Number: _____



Please complete the following information each time you play a video game.

Please return to the researcher, Mallory Stankovich, at the end of 48 hours at your scheduled time.

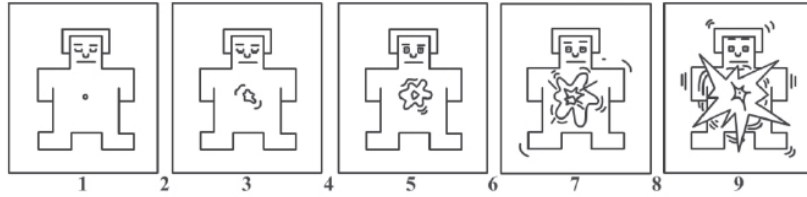
Contact MStankov@umich.edu with any questions.

Video Game Name:

Time Start:

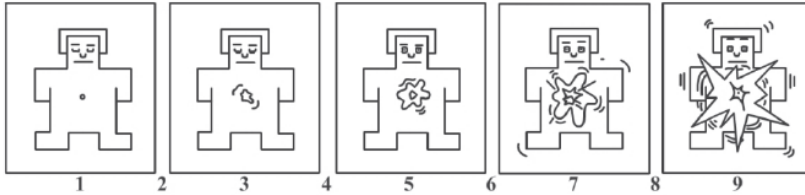
Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.

VIOLENT VIDEO GAME PLAY



Time End:

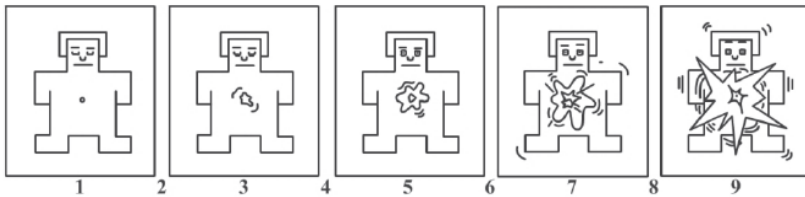
Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.



Video Game Name:

Time Start:

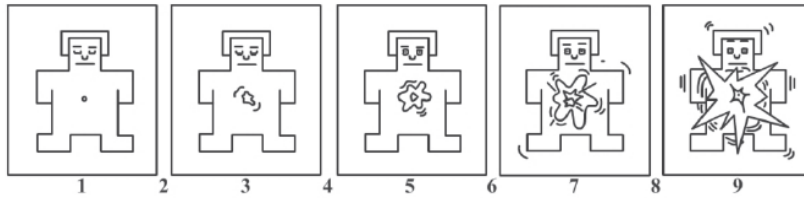
Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.



Time End:

VIOLENT VIDEO GAME PLAY

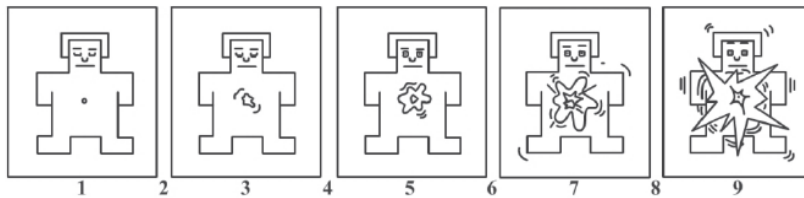
Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.



Video Game Name:

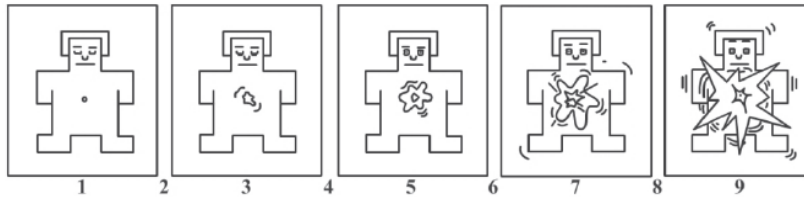
Time Start:

Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.



Time End:

Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.

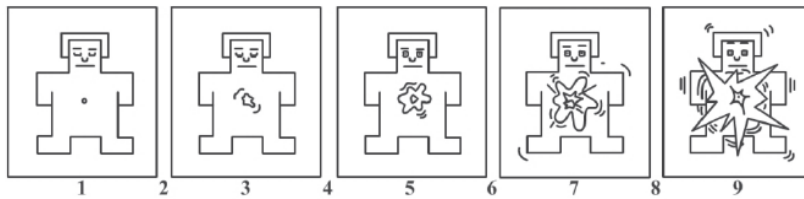


VIOLENT VIDEO GAME PLAY

Video Game Name:

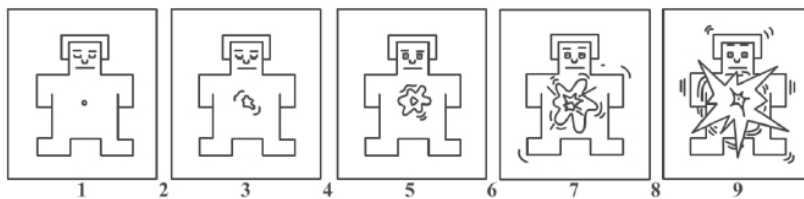
Time Start:

Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.



Time End:

Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.

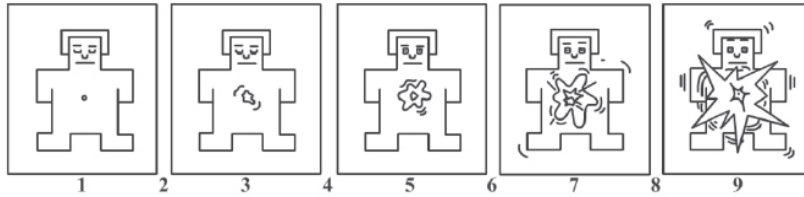


Video Game Name:

VIOLENT VIDEO GAME PLAY

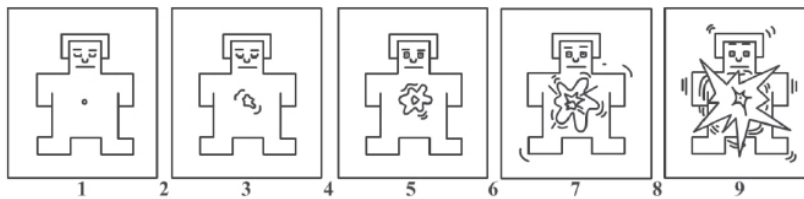
Time Start:

Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.



Time End:

Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.

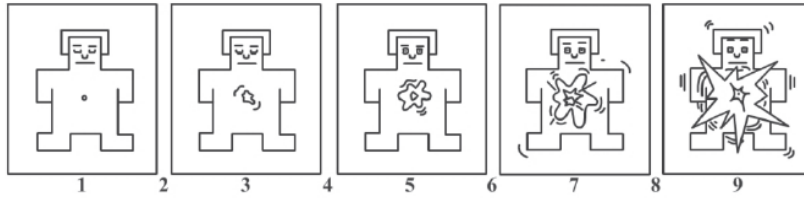


Video Game Name:

Time Start:

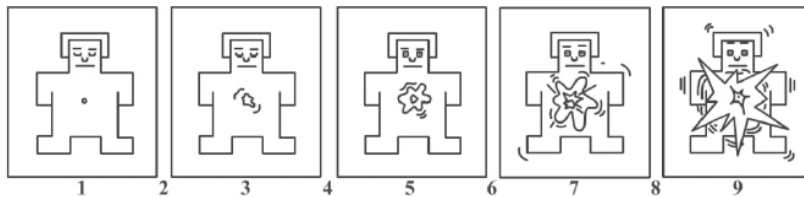
VIOLENT VIDEO GAME PLAY

Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.



Time End:

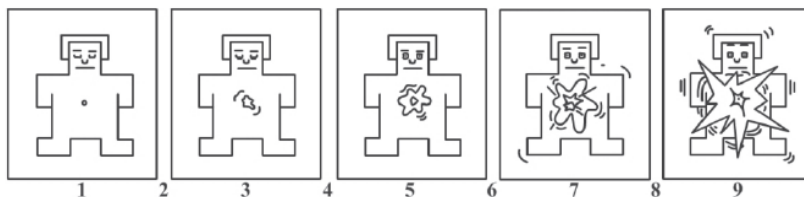
Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.



Video Game Name:

Time Start:

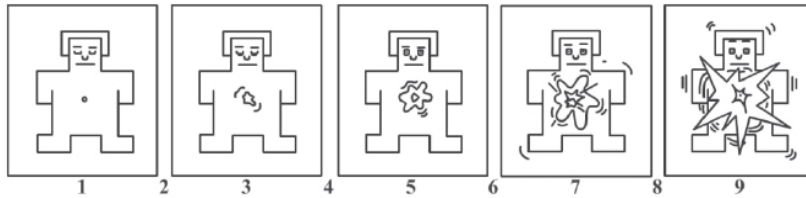
Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.



VIOLENT VIDEO GAME PLAY

Time End:

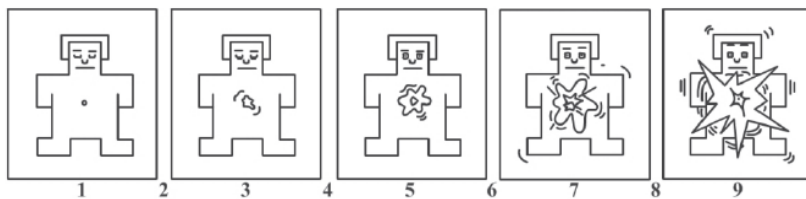
Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.



Video Game Name:

Time Start:

Please circle the number that indicates your level of arousal (feeling calm or excited) **before** playing the game.



Time End:

Please circle the number that indicates your level of arousal (feeling calm or excited) **after** playing the game.

VIOLENT VIDEO GAME PLAY

