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Mood Management and Video-Game Engagement: The Importance of User-Experience and Gender in Assessing the Psychological Effects of Video-Game Play

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MOOD MANAGEMENT AND VIDEO-GAME ENGAGEMENT: THE IMPORTANCE OF USER-EXPERIENCE AND GENDER IN ASSESSING THE PSYCHOLOGICAL EFFECTS OF VIDEO-GAME PLAY

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ABSTRACT

MOOD MANAGEMENT AND VIDEO-GAME ENGAGEMENT: THE IMPORTANCE OF USER-EXPERIENCE AND GENDER IN ASSESSING THE PSYCHOLOGICAL EFFECTS OF VIDEO-GAME PLAY

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The overall purpose of this thesis was to investigate the psychological effects of video-game play. The two central goals were to (a) compare and contrast three classic media theories (Mood Management Theory, The Catharsis Hypothesis, and Excitation-Transfer Theory) as they apply to the effects of video-game play, and (b) investigate the importance of user-experience variables and gender in predicting psychological outcomes of play. In a two-group mixed experimental design, all participants underwent a frustration/stress mood-induction procedure before playing a violent or nonviolent video-game. Questionnaires were administered both pre- and post-play to assess affect, arousal, and dominance as well as the subjective game play experience. After playing the video-game, participants in both the violent and nonviolent game conditions reported a reduction in hostility, an improvement in affect, and an increase in arousal and dominance. Further, the self-reported user-experience variables (e.g., flow variables, performance, and enjoyment) accounted for more of the variance in post-play affect than did game content (violent vs. nonviolent). These findings demonstrate that both violent and nonviolent video-game play can lead to short-term psychological benefits as long as the player feels focused, competent, and positive about the game play experience.

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Introduction

In the 1970s, video-games first emerged as simple activities that involved using a keyboard or dial to control tiny black and white objects on a screen. In 1997, video-games came in color and earned $5.1 billion per year. By 2010, video-games had become a $20 billion industry, rivaling film as America's most popular entertainment medium (Entertainment Software Association, 2011). The increasing complexity and widespread appeal of video-games is further evidenced by recent increases in gaming equipment sales. In November, 2011, Microsoft sold 1.7 million Xbox 360 consoles, a 23% increase from November, 2010. Similarly, Sony sold approximately 70% more PlayStation 3 consoles in November, 2011 than in November, 2010 (Callaham, 2011). Approximately 72% of U.S. households currently play video-games and the average gamer spends approximately 18 hr per week playing (Entertainment Software Association, 2011). In fact, the average American has spent approximately 10,000 hr playing video-games by the age of 21 and this statistic becomes increasingly likely to apply to Americans born after 1980 (Von Ahn & Dabbish, 2008).

Practically every genre of digital game has increased in popularity over the last decade. A case in point is the first-person shooter *Call of Duty: Modern Warfare 3,* released by Activision in November, 2011, which grossed over $1 billion in sales in the first 16 days of its release (Dotson, 2011). Role-playing games have become more popular as well. For example, the game *The Elder Scrolls: Skyrim* (released in November of 2011 by Bethesda) sold 3.5 million copies in the first 48 hr of its release (Thineson, 2011). Meanwhile, players of the online role-playing game *World of Warcraft* (Blizzard,

2004), have spent approximately 50 billion hr playing the game (McGonigal, 2011). Such impressive statistics evidence the incontrovertible popularity of computer and console games today.

The growth in the popularity of video-games is also due to the increased accessibility and portability of gaming devices over the last decade, especially the rise in the number of games available for smartphones and other mobile devices. In 2011, 55% of gamers reported playing games on their smartphones or other handheld devices (Entertainment Software Association, 2011). One of the current most popular mobile games is *Angry Birds* (released by Rovio in December, 2009), a casual problem-solving game featuring a set of cartoon birds that are launched with a slingshot to topple a series of structures housing villain cartoon pigs. As of March, 2011, the game had been downloaded 100 million times and currently has approximately 40 million users, who collectively spend about 200 million min per day playing the game (Alexander, 2011). Clearly, video-games of all genres have become hugely popular, and the medium will most likely become even more prevalent in the future. Not surprisingly, the incredible growth in the diversity and popularity of video-games has inspired research into the effects and uses of digital games from a number of different perspectives.

Video-Game Violence and Pernicious Effects of Play

Many researchers, politicians, and parents have expressed concern about the possible negative effects of violent video-games, and these concerns are nearly identical to those raised in response to the new media of past generations, such as violent movies or certain types of music (e.g., rock or metal). There is little debate that these heightened

concerns are a cyclical phenomenon, but the most recent focus has been on violent video-games and the concern that those who play them will display undesirable (namely aggressive) behaviors. Although there are a number of motives underlying the investigation into the effects of video-game violence, much of the research has been governed by some form of the General Aggression Model (GAM), a theoretical standpoint proposing that violent video-game play primes and/or reinforces aggressive scripts and attitudes, thus leading to aggressive thoughts, feelings, and behaviors (e.g., Anderson & Bushman, 2002; Kooijmans, 2004). Some researchers of violent video-games have argued in favor of the GAM and the relationship between violent media consumption and aggressive behavior, thoughts, and feelings (e.g., Anderson & Bushman, 2001; Anderson, 2004). Similarly, others argue that violent games may cause desensitization to real life violence (Bartholow, Bushman, & Sestir, 2006), which would in turn increase aggressive behavior by reducing empathy and dampening normal responses to violent stimuli (Engelhardt, Barthalow, Kerr, & Bushman, 2011).

In contrast to these claims, however, some studies have shown that violent video-games *per se* do not increase aggression or hostility (e.g., Ferguson, 2007; Valdez & Ferguson, 2012). Ferguson and Dyck (2012) go on to argue that the GAM should be retired and replaced with diathesis-stress models. Although some researchers oppose the GAM entirely, others have asserted that the relationship between violent games and aggressive cognition is moderated by aggressive predispositions such as *psychoticism* and that individuals high in these personality traits are more adversely affected by violent video-game play (Markey, C. & Markey, P., 2010; Ravaja, 2008). Another alternate

explanation for increases in aggressive affect after playing a violent video-game is frustration with game play (Mahood, 2009). With so many potential confounding or extraneous variables, it is difficult to draw conclusions about these effects. Even meta-analyses on the effects of violent video-games have yielded opposing findings, with some reviewers claiming that there is a clear link between violent games and aggressive cognition and behavior (e.g., Anderson, 2004) and others stating that the effects of violent games are negligible or inconclusive (e.g., Sherry, 2001).

One of the aforementioned meta-analyses was conducted by Anderson and Bushman (2001) and focused on the short-term aggressive outcomes of violent video-game play. The authors reviewed empirical findings on the relationship between playing violent video-games and displaying aggressive behavior as well as the relationship between violent game play and aggressive thoughts and feelings. Thirty-three independent tests were used to estimate effect sizes for aggressive behavior and aggressive cognition. For the association between aggressive behavior and violent game play, a pooled correlation coefficient of $r_+ = .19$ ($n = 3{,}033$) was found, which represents a statistically significant but relatively small effect. Practically, an effect size of $r_+ = .19$ estimates that 19% of the variance in aggressive outcomes after game play can be explained by violent content. The association between aggressive thoughts and feelings and violent game play yielded a larger average effect size of $r_+ = .27$. More recently, Anderson (2004) proposed an even higher effect size of $r_+ = .26$ ($n = 5{,}240$) for aggressive outcomes using a meta-analysis that included only "best practice" studies. The author defined best practice studies as those that met a list of nine methodological

criteria (e.g., "The nonviolent video-game condition contained little or no violence"). Overall, the authors concluded that there was a clear link between violent video-game play and aggressive outcomes.

Anderson and Bushman (2001) argued in favor of the GAM; however, another meta-analysis conducted by Sherry (2001) revealed a more complex relationship between violent video-game play and aggressive behavior. Sherry found a similar unweighted mean effect size of $r = .15$, or Cohen's $d = .30$, ($n = 2{,}722$) but also examined subject age, play time, and the year a study was conducted as possible moderator variables. A standard multiple regression analysis was used to assess the independent contribution of each variable in predicting aggressive outcomes. The multiple regression analysis revealed a multiple correlation coefficient of $R = .45$, meaning that the independent variables as a group were able to explain approximately 20% of the variance in aggressive outcomes following violent game play. Interestingly, the year in which a study was conducted emerged as the strongest independent predictor of effect sizes of aggressive outcomes ($\beta = 0.33$), followed by the age of the participants ($\beta = .25$). Studies conducted in more recent years and studies that used older participants were both associated with greater effect sizes. Additionally, in contrast to the findings of Anderson and Bushman, Sherry found that effect sizes for aggressive outcomes decreased with longer game play times ($\beta = -.19$), and that the type of violence portrayed in a game influenced the effect size of aggressive outcomes, with human violence (as opposed to fantasy or sports violence), leading to greater effect sizes.

Taken together, the results reported by Sherry (2001) suggest that there may be extraneous or confounding variables influencing the negative psychological outcomes observed after violent game play (e.g., participant age, year of game release, type of violence). The finding that effect sizes decreased with playtime is a notable finding because studies on negative outcomes of violent video-game play have included game play sessions that range from 5 or 10 min (Ballard & Wiest, 1995) to as long as 75 min (Hoffman, 1995). In very short game sessions, participants may become frustrated because they do not have sufficient time to learn the controls of the game or acclimate to a new activity. In contrast, very long sessions have the potential to produce boredom if participants are not interested in the test game (Sherry, 2001). Empirical evidence for the importance of play-session duration comes from two studies that utilized the same violent video-game (*Mortal Kombat,* Midway Games) but allowed different play times.

Participants in one of the studies (Ballard & Wiest, 1995) played a violent game for 10 min, whereas participants in the other study (Hoffman, 1995) played for 75 min. When the play session lasted 10 min, the reported effect size was $r = .90$ for aggressive outcomes following the game play session. Conversely, when the play session lasted 75 min, a much smaller effect size of $r = .05$ was reported (Sherry, 2001). In addition to utilizing the same violent game, these studies were conducted in the same year, and both used the Buss-Durkee measure of aggression, making them nearly identical aside from the differences in play time. Taken together, these meta-analytic findings indicate that other variables, apart from video-game violence (e.g., duration of play and participant age) may be confounded with violent game content, possibly leading to inconsistent

findings. Moreover, the differences noted by Sherry are not the only limitations to consider when interpreting the literature on violent video-game effects. Ferguson and Savage (2012), for instance, argued that a number of methodological issues in violent media research (e.g., emphasizing simple rather than multivariate findings) are continuously ignored, leading to inconsistent or flawed conclusions produced by new studies with old biases. Simply put, many of the problems that existed within violent television research have extended into violent video-game research.

One further problem with much of the past violent video-game research, especially research citing longer term changes in individual traits like aggressiveness, is that it is correlational in nature. In most cases, it cannot be determined whether violent video-games cause aggression, or whether individuals with higher aggression are seeking out such media. In fact, a recent study found that trait aggression and stress level were predictive of delinquency and bullying in adolescents, but that violent video-game play was not (Ferguson, Olson, Kutner, & Warner, 2010). Of course, experimental research has also been conducted to assess the effects of violent video-game play. However, the results are often difficult to generalize due to methodological inconsistencies. When violent and nonviolent games are used in the laboratory, the nonviolent game is often entirely different from the violent game in terms of color scheme, perspective, structure, and other features. If the games are not matched as closely as possible (with the exception of violent content), it is difficult to establish a causal relationship between the violent content and the observed outcomes. In other words, the game content may be confounded with other features of the game or the subjective game play experience.

Additionally, it is important to note that many of the research findings concerning aggressive outcomes have limited external validity. For instance, aggressive thoughts and feelings (measured by self-report) do not necessarily lead to aggressive behaviors. When experiments do measure aggressive behavior, they often use unstandardized procedures or paradigms (Ferguson, 2007), and measure behaviors that differ greatly from real life acts of aggression. Two of the most frequently used paradigms for assessing aggressive behavior in the laboratory are the "noise blast" paradigm and the "hot sauce" paradigm.

In the noise blast paradigm, participants are led to believe that they are competing with another participant on an auditory reaction time task. Participants are instructed to click a mouse button as quickly as possible after hearing a sound. In phase 1 of the paradigm, they are told that their opponent has selected the level of "noise blast" that they will receive each time they respond more slowly than the opponent. Contrary to what they have been told, the participants are competing against a computer program that randomly selects which trials are won or lost. In phase 2, participants are allowed to retaliate against the fictional opponent by selecting the level of white noise the opponent will receive. A number of studies have used the severity of the noise blast selected by the participant at this point in the paradigm as a measure of overt aggressive behavior (e.g., Anderson, Lindsay, & Bushman, 1999; Carlson, Marcus-Newhall, & Miller, 1989; Giancola & Zeichner, 1995).

In another paradigm, termed the "hot sauce" paradigm, participants select the quantity and "hotness" of hot sauce that they believe another participant will consume

(Lieberman et al., 1999). Each participant is told that the individual who will eat the hot sauce does not like spicy foods, and that he or she will have to eat whatever amount the participant chooses to administer. The amount of hot sauce that the participant pours into the cup and the spiciness level that he or she selects are both used as measures of aggressive behavior (e.g., Adachi & Willoughby, 2011).

In cases where aggressive thoughts, feelings, and behaviors have been measured, there is little evidence that the aggressive outcomes of violent video-game play observed in laboratory settings can be applied to everyday life. First, the paradigms most commonly used to assess aggressive behavior (e.g., administering obnoxious noise blasts or serving controversial condiments), have very little in common with acts of aggression that result in real physical harm to another human being (e.g., hitting, stabbing, shooting). Second, there is very little evidence of any long-term aggressive outcomes of violent video-game play. In fact, a recent study reported that the aggressive feelings, thoughts, and behavior observed directly after game play were no longer significant 4-9 min later (Barlett, Branch, Rodeheffer, & Harris, 2009). Bushman and Gibson (2010) reported that the aggressive effects of violent video-games could last up to 24 hr after game play, but only for men who were instructed to ruminate about their performance in a violent video-game they had played the previous day.

Neuroimaging studies parallel the findings of many of the psychological studies on violent video-game effects. For instance, a recent study reported that violent video-game play lead to potentially undesirable changes in brain activity (e.g., Bartholow, Bushman, & Sestir, 2006; Wang et al., 2009), but the neural differences observed in the

study were recorded directly after game play, replicating only the short-term changes found previously using self-report measures. Another recent study demonstrated that young men assigned to play a violent video-game showed less activation in the executive regions of the brain after one week of violent game play at home (Indiana University School of Medicine, 2011). Those in the violent game condition showed less activation in the left inferior frontal lobe during an emotional Stroop task and less anterior cingulate cortex activation during a counting Stroop task. After participants in the violent game condition stopped playing games, the two conditions no longer differed significantly in activation of these brain regions.

The concern surrounding these results was that the temporary changes in these brain regions, which are related to executive control, would lead to less efficient control of emotion or behavior. Unfortunately, the study did not include a condition in which participants played a similarly fast-paced, reaction-time dependent nonviolent game, so there remains the possibility that some of the observed changes were due to the learning of game mechanics or controls (which require quick reaction times for success), rather than the violent content by its very nature. Clearly, the violent video-game literature as a whole has yet to come to an agreement regarding the origin, severity, and duration of violent video-game effects, and especially how the effects observed in the lab relate to real life acts of violence. Although a number of short-term negative effects have been observed in relation to violent video-game play, caution should be taken to avoid exaggerating the findings, especially when extraneous variables may be influencing the reported outcomes.

Cognitive, Educational, and Prosocial Effects of Video-Games

Although many researchers focus on violent content in video-games, some have argued that video-game play (particularly action video-game play) results in cognitive benefits such as the ability to respond to stimuli more quickly without sacrificing accuracy (Dye, Green, & Bavelier, 2009). There is also growing evidence that video-games may serve as effective educational tools, or even improve social behavior (e.g., Gentile, 2009; Moshirnia & Israel, 2010). Many of the cognitive, educational, and prosocial effects of video-games can be explained, in part, by the fact that video-games differ across a number of dimensions with each dimension leading to a different set of effects (e.g., Gentile & Stone, 2005).

Gentile (2011) argued that there are at least five different facets of game play that are all uniquely important in understanding the psychology of game play. These dimensions are *amount*, *content*, *context, structure*, and *mechanics*. The amount of game play is defined as the number of hours or minutes that an individual engages in video-game play over a specified time period, and content is usually defined in terms of the themes and script elements present within a game. The context of a game refers to the circumstances surrounding a specific game play scenario. For example, two individuals could play "Deathmatch" in Call of Duty: Black Ops, but the context may differ drastically. One individual might play "Team Deathmatch," which involves cooperation and teamwork, whereas the other might play "Free for All," where every player attempts to kill all other players. In this example, the level of violence is the same in both types of matches, but the context differs in a way that is likely to lead to different psychological

outcomes. Along the same lines, games that are played alone differ in context from those that are played with friends, or in large online communities (Gentile, 2011).

Game structure, which is primarily concerned with visual input, refers to the order and presentation of features displayed in a game. The complexity of a specific virtual environment is an example of structure, as is the navigational style of a game. While game structure is associated with visual stimuli, the mechanics of a game primarily encompass the physical interactions between the player and the video-game. The fine motor movements used to accurately control a character's in-game actions with a controller demonstrate one aspect of game mechanics (Anderson, Gentile, & Dill, 2012).

Past research suggests that there is a link between these five elements of game play and different types of effects. For example, excessive game play is associated with displacement effects (replacing more favorable or productive activities), whereas game structure influences visual attention. The distribution of visuospatial attention, for example, appears to be greater in individuals who play action video-games compared with controls (Green & Bavelier, 2006). In other words, individuals who play more action video-games have more attentional resources, and perform better on multiple object tracking tasks. Studies have further shown that individuals who engage in action video-game play have heightened visual search efficacy (Castel, Pratt, & Drummond, 2005), and that gender differences in spatial cognition can be reduced through action video-game play (Feng, Spence, & Pratt, 2007).

When it comes to the content of a video-game, proponents of the General Learning Model (GLM) have asserted that the themes in a game influence the types of

thoughts and feelings that are activated in the player (Buckley & Anderson, 2006). To provide more detail, the GLM asserts that a person's behavior is based on both personal and situational variables. Personal variables are the relatively static tendencies, beliefs, and emotions of an individual, while situational variables arise from the environment (e.g., media, settings, and other people).

When it comes to the pedagogical effects of video-games, learning arises from complex interactions between situational and personal variables. Some personal variables such as age, skill level, or self-esteem may influence the extent to which an individual learns from the content of a video-game. Situational variables that come from the video-games themselves influence their potential to teach players as well. Players are more likely to learn from games that are able to capture their attention for longer period of time, and the content of the game may influence what the player learns (Buckley & Anderson, 2006). Indeed, some of this knowledge about video-games as tools for learning has been utilized in educational psychology. Video-games have been successfully utilized for educational purposes using modified commercial video-games that increased students' understanding of concepts and retention of knowledge (Moshirnia & Israel, 2010), and specially designed educational formats that increased active engagement in the subject matter (Watson, Mong, & Harris, 2011).

According to the GLM, both antisocial and prosocial video-games have long- and short-term effects. A learning encounter in the short-term should result in temporary changes in mood, arousal, and cognition. The GLM predicts that long-term effects of video-games, whether positive or negative, will arise through classical and operant

learning mechanisms. In other words, the model predicts that actions that are reinforced or punished in a video-game will influence future decision-making, creating a "continuous cycle of learning and reinforcement" (Gentile et al., 2009).

Granting all this, video-games with prosocial content should activate favorable, prosocial thoughts in the same manner that a game containing antisocial violence should prime aggressive cognition. To investigate this hypothesis, Gentile et al. (2009) reviewed three separate studies from around the world on the relationship between prosocial game play and prosocial behavior. The researchers found that for both Singaporean children and Japanese children, playing games with prosocial content was correlated with more prosocial behavior. Likewise, an experimental study conducted in the U.S. showed that university undergraduates assigned to play prosocial video-games demonstrated more prosocial helping behavior toward other students directly after game play than did undergraduates who played neutral or violent video-games.

Evidently, prosocial video-games often lead to short-term changes in prosocial thoughts and behaviors, the same way violent games lead to short-term changes in aggressive affect. Again, however, there is not sufficient evidence to support the existence of any long-lasting effects or changes. The short duration of the prosocial effects observed suggests that positive effects of video-game play (like the deleterious effects discussed earlier), may be due to certain qualities of the game play experience, and not the result of long-term changes occurring in the individual. In any case, there is ample evidence to conclude that video-games may be a force for good when it comes to visuospatial skills, attention, and education.

The Enjoyment of Video-Games

Despite some of the concerns surrounding game play, video-games continue to rise in popularity, and the psychology of their appeal is becoming a topic of greater interest. Researchers have begun to investigate the particular variables or aspects of game play that are the most enjoyable, exciting, or motivating, and recent research has investigated the impact of variables like *control* (Klimmt, Hartmann, & Frey, 2007) and *immersion* (Ravaja et al., 2008) on game enjoyment and motivation to play. *Control*, in a gaming context, refers to the extent to which a player feels that he or she can anticipate the workings of the game environment and manipulate or influence that environment in desirable ways (Klimmt et al., 2007). *Immersion* refers to a state of complete absorption in the game, which is commonly experienced by gamers. Players who are immersed in a video-game will often play longer than originally planned and devote complete attention to the demands of the virtual gaming environment to the exclusion of other, non-gaming events.

Other investigations into the enjoyment of video-games have been theory-driven. For example, Self-Determination Theory proposes that human beings have innate psychological needs for *competence, autonomy, and relatedness*, and the satisfaction of these needs provide the basis for self-motivated behavior (Deci & Ryan, 2000). Competence and autonomy, as defined by the researchers, refer to feelings of adequacy and independence, respectively, and relatedness refers to a feeling of connectedness with others. In 2006, Ryan, Rigby and Przybylski investigated video-game enjoyment using Self-Determination Theory as a framework. The researchers hypothesized that the appeal

of a video-game would depend on its ability to meet basic psychological needs, thereby increasing enjoyment, motivation, and short-term well-being. In line with the hypotheses, the study demonstrated that when a video-game afforded the player feelings of competence and autonomy, the player was more motivated to continue playing the game. Furthermore, the authors found that perceived autonomy and competence within the game lead to positive psychological outcomes for the player, increasing self-esteem, vitality, and mood.

Large-scale surveys have also shed some light on the structural elements of games that are important for enjoyment. Wood, Griffiths, Chappell and Davies (2004), for instance, conducted a comprehensive survey on the structural elements of game play and their importance to players. The survey utilized a large sample of self-selected gamers age 14 to 50 (n = 382), most of which were university students. The researchers found that the game characteristics rated highly important for enjoyment were *high-quality realistic graphics*, the *ability to save regularly, rapid absorption rate* (becoming immersed quickly), *exploring new areas*, and *elements of surprise*; all of which were rated as important by more than two thirds of the sample. Other characteristics that were rated as important by a majority of the participants included *fulfilling a quest, skill development, sophisticated AI interactions* (interactions between the player and enemies, or the player and other non-player characters), *character development over time*, and *realistic sound effects*. Other research has reported the importance of *suspense* (Klimmt, Rizzo, Vorderer, Koch, & Fischer, 2009), *competition* (Vorderer, Hartmann, & Klimmt,

2003), *storyline* (Schneider, Lang, & Bradley, 2004), and *avatar creation* (Trepte, & Reinecke, 2010) in video-game enjoyment.

There is also some evidence for gender differences in video-game enjoyment. More specifically, some research suggests that females do not enjoy video-games to the same extent that males do. For example, Hoeft et al. (2008) found that when participants were asked to play a simple video-game during an fMRI scan, males showed more activation in the reward regions of the brain than did females (i.e., the right nucleus accumbens, bilateral orbitofrontal cortex, and right amygdala). Other research suggests that differences in enjoyment may be due to differential preferences when it comes to game elements. Hartmann and Klimmt, (2006) assessed females' dislikes about video-games and reported that females did not like violent content or gender stereotyping in video-games, and were less attracted to games that focused on competition or lacked meaningful social interaction. In sum, the literature suggests that video-game enjoyment partially depends on psychological need satisfaction and personal preferences for specific game elements and experiences.

Media Effect Theories

In addition to the recent novel investigations into new media like video-games, a number of theories have been used in the past to explain the uses and gratifications associated with media in general. Three of these classic media theories are *Mood Management Theory* (Zillmann, 1988), *The Catharsis Hypothesis* (Lorenz, 1963), and *Excitation-Transfer Theory* (Zillmann, 1971). Because these theories have been helpful in understanding traditional forms of media, they provide a good initial framework upon

which to investigate new forms of media (e.g., interactive digital games). Each theory and its unique predictions will be discussed in detail.

Mood Management Theory. Mood Management Theory (MMT) is based on the assumption that human beings are hedonistic by nature. In other words, individuals are naturally driven to increase pleasure and reduce pain or discomfort. Therefore, to the extent possible, individuals attempt to arrange stimuli in their environment to increase pleasurable mood states and decrease or eliminate noxious mood states (e.g., sadness, boredom, or stress). Furthermore, actions that arrange stimuli that successfully relieve aversive mood states become reinforced, and are then more likely to occur again under similar circumstances as a result of operant conditioning (Zillmann, 1988). For example, if an individual returns home from work feeling stressed, he or she may decide to play a problem-solving video-game. If the game reduces the noxious mood state, the individual will likely choose that game or a similar game in the future to repair feelings of stress. Likewise, if playing an action or first-person shooter game has helped an individual relieve boredom in the past, he or she is more likely to select that game type in the future due to the effects of positive reinforcement. Individuals who have previously enjoyed playing a certain type of video-game would derive more benefits from playing that game (or similar games) in the future.

Initial research into mood management through media choices examined the effects of preexisting mood on the decision to watch certain television programs (Zillmann & Bryant, 1984). Researchers also examined differences in mood following exposure to various genres of music (Labbe, Schmidt, Babin, & Pharr, 2007), the

association between mood and movie rental choices (Strizhakova & Krcmar, 2007), and adolescents' use of interactive digital media to manage depressed mood states (Dillman, et al, 2008). However, the results of mood management studies are often incongruous. Some studies seem to demonstrate that individuals in negative mood states benefit most from media that oppose their current mood and arousal state. According to some researchers, this is because the media disrupts the current negative mood state, leading to more rapid mood repair (Knobloch & Zillmann, 2002). In other studies, however, it has been found that individuals are more likely to prefer and later benefit from media that reflect their current mood state rather than oppose it, particularly when the initial mood state was melancholy or anxious (Knobloch & Zillmann, 2003).

More recently, researchers have applied MMT to video-game play. Researchers have examined the effects of physical *interactivity* (Chen & Raney, 2009) and *task demand* (Bowman, 2010) as determinants of video-game proficiency in mood management. These studies utilized the two induced mood states of boredom and frustration because these two noxious mood states represent a state of very low arousal (boredom) and very high arousal or overstimulation (frustration). The findings of both studies lent some support for mood management while emphasizing the influence of specific game variables on mood repair.

Chen and Raney (2009) examined the effect of *interactivity* on mood repair by comparing game play on the Nintendo Wii console with less physically interactive media formats (a flash-driven version of the game and a DVD clip). Following a negative mood-induction, participants who played a Wii Boxing game experienced more mood

repair than participants who played a flash driven boxing game or watched a DVD clip of a boxing match.

Bowman (2010) investigated the role of *task demand* in mood repair by experimentally varying the level of action (or number of controls) needed to play a flight-simulation video-game. All participants were university students and were subjected to a stress or boredom mood-induction before being randomly assigned to one of three task-demand conditions. Stress was induced by requiring participants to complete extremely difficult logic problems, which they were told came from basic intelligence tests. Boredom was induced by instructing participants to thread washers onto a string. The three video-game conditions were low demand, medium demand, and high demand. The low demand condition required no action (participants simply watched the game being played on auto-pilot), the medium demand condition required minimal action on the part of player, and the high demand condition required the participant to control all actions in the game (auto-pilot was completely turned off). Results of the study revealed that heightened task demand increased mood repair, but too much task demand negatively affected mood repair. In addition, bored participants experienced a greater improvement in mood as a product of task demand than stressed participants experienced.

Another study by Mulligan (2008) investigated mood management via exposure to the massively multiplayer online role-playing game (MMORPG) *World of Warcraft* (released by Blizzard Entertainment in 2004). Mulligan reported that following a stress or boredom mood-induction, participants experienced an increase in positive affect after 10 min of game play, thus suggesting that the video-game was able to interrupt rehearsal

of the negative state surrounding the mood-induction. Mulligan's (2008) claim that video-game play improved mood was further supported by the fact that participants in the control condition, who did not play a video-game, did not experience a significant improvement in mood.

Although some new variables (like task demand and interactivity) have been examined recently, Zillmann (1988) proposed that there are four main mood-impacting characteristics of media types that help determine which types of media are more or less likely to repair a noxious mood state such as boredom or frustration. These mood-impacting characteristics serve as a framework for the more recent investigations into mood management. One mood-impacting characteristic is the *absorption potential* of a media message. Generally speaking, a mood state (whether positive or negative) is maintained by cognitive rehearsal of the circumstances surrounding the mood. For a positive mood state, this may involve rehearsing the positive event that recently occurred and led to the current good mood. For a negative mood state, this may involve fixating on a recent negative experience or rehearsing negative feelings, fears, or frustrations. According to this aspect of MMT, individuals who are experiencing a noxious mood state would benefit the most from highly absorbing media (Zillmann, 1988). This assumption predicts that highly absorbing media will alleviate noxious mood states by disrupting the cognitive rehearsal that maintains them. Video-games provide highly absorbing, interactive experiences, which should therefore increase the propensity for video-games to be effective mood management tools.

One might assume based on this notion that all video-games can serve as effective mood management tools based on their high level of absorption potential. However, Zillmann's (1988) additional mood impacting characteristics of media messages suggest that the type and content of the video-game (especially in relation to the preceding mood state) may be equally crucial in determining its mood repair potential. In other words, not all types of video-games should be equally effective in repairing noxious mood states. For example, the *semantic affinity*, or similarity between the current mood state and the media message, often reduces or eliminates absorption potential (Zillmann, 1988). An individual experiencing a positive mood state is able to maintain, and not disrupt, his or her mood by consuming media with a high semantic affinity to the current affective state. Similarly, but with a less favorable outcome, consuming media with a high semantic affinity to the negative mood state maintains the current aversive mood rather than disrupting it.

A wealth of research has demonstrated that frustration may lead to aggression (e.g., Berkowitz, 1989; Dill & Anderson, 1995; Dollard, 1939), so it is reasonable to assume that there is semantic affinity between the mood state of frustration and a type of media that engages the user in fictional acts of aggression. Therefore, in terms of video-game use, this element of MMT would predict that frustrated or stressed individuals would not benefit from playing a violent video-game, due to the semantic affinity between the mood state of frustration and the aggressive theme present in a violent video-game. Indeed, Zillmann and Johnson (1973) found that participants who had been provoked experienced a reduction in aggression after watching a neutral film, but not

after watching a violent film. Similarly, another study by Bryant and Zillmann (as cited in Donohew, Sypher, & Higgins, 1988), demonstrated that frustrated participants who watched violent sports did not experience mood repair, and that the most mood repair occurred with media types that were highly absorbing but unrelated to anger and provocation.

Another mood-impacting characteristic is the *excitatory potential* of a media type, which is relevant with regard to physiological arousal level. Excitatory potential has the propensity to adjust the intensity of a mood state by increasing or decreased sympathetic nervous system arousal. In general, mood states that are characterized by high sympathetic arousal (such as stress or frustration) are most likely to be *maintained* by consuming or interacting with media messages that are high in excitatory potential. The same noxious states (e.g., frustration), are most likely to be *alleviated* through the consumption or use of media messages that are low in excitatory potential. Therefore, an individual who is frustrated or stressed would benefit most from consuming relatively calm and not overly exciting media, whereas an individual who is bored may benefit more from media high in excitatory potential. When applied to video-games, we would expect that in terms of reaching a comfortable arousal level, individuals who are frustrated would benefit most from playing nonviolent, self-paced problem solving games, because these games have low excitatory potential. Individuals who have a very low level of arousal (i.e., boredom) might benefit more from game types that are faster paced and more exciting.

Another mood-impacting characteristic, the *hedonic valence* of media messages, refers to the pleasure or pleasantness associated with various media messages. Positive affective states are best maintained by pleasant, positive, or neutral media messages and disrupted by unpleasant media messages, whereas noxious mood states are maintained by unpleasant media and repaired with the use of pleasant, positive media (Zillmann, 1988). The hedonic valence aspect, when considered alone, suggests that frustrated individuals would simply benefit from any positive media experience. In past research, the term *positive media* has been used to describe television comedies, or programs designed to elicit laughter and joy. The terms *negative* and *unpleasant media* traditionally have described media messages that involve violence, death, or other unpleasant concepts. Therefore, a nonviolent problem-solving game would fall into the category of positive or neutral media messages, but a violent video-game would be considered an unpleasant media message unsuitable for repairing a noxious mood state.

In summary, MMT assumes that all individuals are motivated to maintain positive mood states and alleviate aversive mood states. If all four mood-impacting characteristics are required to occur simultaneously, then the theory predicts that a shift toward a more positive mood and physiological arousal state is most effectively facilitated by exposure to highly absorbing and gratifying media that are (a) opposite to the aversive mood state in terms of excitatory potential, and (b) do not have semantic affinity with the aversive mood state. For individuals who are frustrated, this would mean that a more positive mood and physiological arousal state would be achieved

through exposure to, or interaction with absorbing, gratifying media that is (a) low in excitement, and (b) does not involve themes related to stress, frustration, or aggression.

It follows, based on all four tenets together, that frustrated individuals would become less frustrated and more positive in affect after playing a self-paced problem solving game, compared to a highly exciting first-person shooter game, which is characterized by a high-stress environment and objectives that require aggressive action. MMT would be best supported if frustrated individuals who played a nonviolent video-game showed more positive affect and less physiological arousal after game play than those who played a violent first-person shooter game.

The Catharsis Hypothesis. MMT does not paint a favorable picture of violent media and its potential to repair stress, frustration, or anger. However, there is certainly evidence that some individuals (particularly those high in sensation seeking), tend to enjoy media that is not typically considered positive or pleasant, such as horror films (Johnston, 1995), or violent media (Zaleski, 1984). Based on the early evolutionary model of aggression presented by Lorenz (1963), The Catharsis Hypothesis states that aggression is a natural, evolutionarily adaptive response often brought on by stress in the environment. The idea of a catharsis (meaning "cleansing" or "purging") can be traced back to Aristotle and refers to the assumption that periodically releasing aggression allows an organism to keep aggressive motives and feelings at manageable levels. In the context of media consumption, simulated aggression (e.g., through video-game play) should reduce the possibility of real-life aggressive acts by alleviating the aggressive feelings. In contrast to the main predictions of MMT, The Catharsis Hypothesis suggests

that individuals who are feeling frustrated, stressed, or aggressive may actually benefit from releasing such feelings in non-harmful ways. A safe release of aggression may include watching a violent film for the vicarious experience of violence, or playing violent video-games.

Although a number of researchers have argued against the theory in the past (Bushman, Baumeister, & Stack, 1999; Geen, Stonner, & Shope, 1975; Geen & Quanty, 1977), The Catharsis Hypothesis has not been thoroughly investigated when it comes to video-game play. Most research on the effects of violent game play has used affect-neutral participants and then exposed them to violent video-games. An investigation of The Catharsis Hypothesis would require participants to be frustrated, stressed, or angry *before* exposure to such games (Ferguson & Rueda, 2010). In reference to past literature, Olson, Kutner and Warner (2008) found that young boys reported feeling less aggressive and more relaxed after engaging in violent video-game play. Correspondingly, teenage boys surveyed in a study by Kestenbaum and Weinstein (1985) reported using violent video-games to manage developmental conflicts and let out aggression.

Other researchers suggest that video-games are effective in relieving stress simply because they are leisure activities that provide an enjoyable experience (Iwasaki, MacTavish, & MacKay, 2005). If The Catharsis Hypothesis is indeed correct, then individuals who are frustrated should experience a greater reduction in feelings of hostility and frustration after playing a first-person shooter video-game than after playing a nonviolent video-game. If the reduction in hostility is not specific to violent video-

game play, however, then an alternate explanation (e.g., games as leisure activities or general mood management tools) may be more plausible.

Excitation-Transfer Theory. Another theory relating to the potential effects of various media types is Excitation-Transfer Theory (Zillmann, 1998). This theory proposes that when an individual experiences a stimulus or engages in an activity that is physiologically arousing, the physiological reaction can often carry over to intensify later emotional states. The theory helps to explain how emotions often change very rapidly (e.g., fear of an intruder in your home turning into relief or even joy when you realize it was only a coat rack). Additionally, Zillmann's (1998) theory shares some ideology with Schacter's (1971) two-factor theory of emotion concerning the attribution and misattribution of physiological arousal.

According to Zillmann (1998), Excitation-Transfer Theory requires three conditions in order to take effect. First, the second stimulus must occur close enough in time to the first that the initial excitation has not yet decayed. Second, a misattribution of excitation must occur such that the individual attributes the excitation to the second stimulus, and third, the individual must not have reached an excitatory threshold before experiencing the second stimulus. Excitation-Transfer Theory has been applied to a number of different psychological and communication topics such as aggression (Anderson et al., 2003), sexual attraction (Meston & Frohlich, 2003), and violent media enjoyment (Zillmann, 1998).

Excitation transfer may increase the appeal of violent or horror media in the following manner. When individuals view something that is frightening or violent,

physiological arousal is elevated. When the frightening or violent stimulus is removed, or when an encounter concludes, the individual is overcome with relief. According to the idea of excitation-transfer, the heightened physiological arousal caused by something frightening or violent may carry over and intensify the subsequent feeling of relief, often causing a brief state of euphoria.

For example, if an individual becomes anxious or fearful while watching a villain commit a series of crimes in a movie, that fear and anxiety will subsequently increase the feelings of relief and happiness that are felt once the villain is brought to justice. A number of studies have supported the occurrence of excitation-transfer (Cantor, Zillmann, & Bryant, 1975; Reisenzein, 1983; Sparks, 1991; Zillmann, 1978; Zillmann, Mody, & Cantor, 1974). For example, Sparks (1991) examined three separate studies and reported significant correlations between ratings of distress and ratings of positive affect after watching violent films.

Given this type of evidence, it is reasonable to assume that the same type of excitation-transfer could occur while playing a violent video-game. In a first-person shooter video-game, players are put in a highly stressful situation where they may be shot or attacked at any moment by enemies. If the player is faced with a threat (e.g., a member of the opposite team shooting at them) and he or she successfully eliminates that threat (by killing the attacker before their character is killed) then excitation-transfer should occur. In other words, the stress or threat of being attacked would subsequently intensify the relief felt once the attacker was eliminated, leading to a brief feeling of euphoria. In this way, some dynamics of a first-person shooter are similar to watching a

violent film; however, a first-person shooter is much more fast-paced and interactive. Whereas excitation-transfer may only occur a handful of times (or even once) while watching a film, the highly rewarding feeling tied to threat elimination in a first-person shooter could be felt numerous times during the game, depending on the performance of the player.

If excitation-transfer can indeed occur with such frequency in a first-person shooter, then the popularity of these video-games should not be surprising. Excitation transfer may occur throughout game play, or culminate to produce heightened positive affect at the conclusion of a shooting match, thereby making the game more reinforcing due to the game's association with positive affect. This theory would be best supported by a positive correlation between physiological arousal level and positive affect after game play for individuals who played a first-person shooter game, but not for individuals who played a non-threatening, nonviolent video-game.

User-Experience and the Flow State

The traditional viewpoints proposed by the aforementioned media effect theories were developed to be applied to media with fixed narratives. Unlike watching a movie or TV show, the actions of a user playing a video-game have an impact on exactly how the narrative plays out. When people use interactive media, they are not only witnesses but are participants as well (Vorderer, 1999). Therefore, when researchers attempt to understand interactive media effects by applying traditional frameworks, they should not overlook the importance of user-experience variables.

User-experience has been defined as a person's perceptions about a series of interactions between events, people, and devices (Reiss, 2009). User-experience focuses on the affective and experiential aspects of human-computer interaction (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009). The *flow* state, originally defined by Csikszentmihalyi (1977) is an aspect many researchers consider to be crucial to a positive user-experience (e.g., Cowley, Charles, Black, & Hickey, 2008; Mathwick & Rogdon, 2004). The state of flow is a psychological state characterized by a narrowed focus of awareness and attention, such that all irrelevant thoughts are dismissed. In the context of video-game play, this sensation occurs through a loss of self-consciousness, a sense of control over the game environment, and the opportunity to respond to clearly defined goals guided by unambiguous feedback. The flow experience is achievable in a game setting where the player's skill is matched by an appropriate level of challenge. This leads the players to enjoy the experience but at the same time stretch their capabilities in a manner that facilitates increased learning and enhanced self-esteem.

Csikszentmihalyi (1977) identified eight elements that facilitate an optimal flow experience. These eight components of the flow experience are (a) a challenging activity that requires skill, (b) a merging of action and awareness, (c) clear goals, (d) direct and immediate feedback, (e) concentration on the task at hand, (f) a sense of control, (g) a loss of self-consciousness, and (h) an altered sense of time. Although all eight components are not required to occur simultaneously for a flow state to occur, each facet is an important part of the experience. Given these eight tenets, it is easy to see how video-games may be especially suited to provide individuals with an experience of flow.

In accordance with the first aspect of flow, video-games are certainly activities that require skill and challenge. Although different game types and varying player experience levels may result in an experience that is more or less challenging, all video-games require the player to learn the controls of the game and to reach certain objectives or complete various activities. In many cases, the difficulty level on a game is adjustable, in order to allow the player to match their skill level with the level of challenge presented in the game. Of course, it is possible for players to be met with too little challenge, leading to boredom, or challenges that are too far above their level of skill, leading to anxiety or frustration. In order for flow to occur, there must be a balance between the challenges provided by the game and the skill level of the player (Chen, 2007). Once the controls and requirements of a video-game are learned, and if skill level and challenge are well matched, interacting with the game environment becomes more intuitive. The player is eventually able to merge action and awareness, carrying out in-game actions with increasingly less conscious effort.

The third aspect of flow involves the presence of clear goals. Most video-games provide specific goals for the player to reach, such as completing a quest, defeating an enemy, or winning a race. Some in-game goals are more difficult to reach than others, but each goal is clearly defined and guided by the rules of the game environment. Furthermore, players are guided by immediate, unambiguous feedback; the fourth facet of flow. The game environment responds immediately to player keyboard, mouse, or controller commands, and the player is able to carry out in-game actions quickly. In most games, a wrong course of action toward an objective will result in loss or defeat, while

correct courses of action are rewarded with such incentives as points, continued game play, or advancement to new levels/scenarios.

Concentration on the task at hand is the fifth aspect of flow. Unlike watching television, playing a video-game demands the player's full attention. In most cases, a lack of attention during game play will result in unfavorable consequences such as the death or defeat of the player character. Concentration on the game is required in order to reach in-game objectives, solve puzzles, defeat enemies, or complete quests. In mastering such tasks, the player experiences a sense of control, which is the sixth facet of flow. A sense of control is easily attainable within a virtual environment wherein the player character is at the center of effects occurring in the game environment. Players are able to make an immense impact on the game environment, without ever being at risk of real life harm.

Finally, the seventh and eighth facets of flow are a loss of self-consciousness and an altered sense of time. A loss of self-consciousness during game play is often referred to as a state of immersion (IJsselsteijn, dKort, Poels, Jurgelionis, & Bellotti, 2007), or telepresence (Novak, Hoffman, & Yung, 2000). When players are in this state, they have a sense of being part of the computer or game world, and are less likely to pay attention to their immediate physical surroundings. A loss of self-consciousness is often accompanied by an altered sense of time, or time distortion. Individuals who have been immersed in game play often report that time seemed to either slow down or speed up.

As highly absorbing and interactive activities, video-games are a unique medium in terms of the diverse experiences they are able to provide. When certain criteria are

met, video-games are able to lead players into "flow zones," which create feelings of accomplishment, control, and even euphoria, sometimes called "fiero moments," or moments of extreme personal triumph (Lazzaro, 2004 as cited by McGonigal, 2011). User-experience and the flow state have been studied rather extensively in relation to web use, product design, and even video-games, however the psychology of media effects and human computer interaction (HCI) have remained largely separate in the literature.

Psychological media effect studies have rarely examined the importance of user-experience variables in understanding the psychological effects of video-games. Because video-games have become (and will continue to become) increasingly popular, it is important to merge our understanding of user-experience with our understanding of media effects when examining interactive forms of entertainment. Although there are a number of classic theories that predict media effects, these theories alone are unable to offer a sufficient framework for understanding the interactive media types that are most popular today. In order to gain a better understanding of these effects, user-experience variables must be recognized as critical factors in understanding the psychology of game play.

The Present Study

Motivational factors and the enjoyment of video-game play have been examined in recent years (e.g., Klimmt, Hartmann, & Frey, 2007; Hoffman & Nadelson, 2010; Przybylski, Ryan, & Rigby, 2009), along with the relationship between violent video-games and aggression (e.g., Anderson & Bushman, 2001). However, research is still sparse concerning the propensity for video-games to decrease stress and improve mood,

and most previous psychological studies of video-game effects have failed to take into account gender differences, and/or differences in the subjective game play experience that may affect outcomes. Therefore, the purpose of the current study is twofold. First, this study will compare and contrast MMT, The Catharsis Hypothesis, and Excitation-Transfer Theory as they apply to the effects of video-game play in a sample of gamers. Second, this study will examine both gender and user-experience variables (e.g., flow variables, enjoyment, and performance) and how each may affect psychological outcomes.

In order to explore the utility of the three media theories in understanding the psychology of video-game effects, and to investigate gender and user-experience differences, a mixed experimental design will be used. All participants will undergo a mood manipulation procedure in order to induce stress and frustration, which will serve as the prevailing noxious mood state necessary to adequately test the assumptions of MMT and The Catharsis Hypothesis. Random assignment will determine whether a participant plays a violent or a nonviolent video-game following the mood-induction. The within-subjects variables of interest will be the state psychological attributes (affect, arousal, and dominance) reported before and after game play, and the between-subjects variables of interest will be the type of game played (violent or nonviolent), gender, and user-experience variables (e.g., flow variables, performance, and enjoyment).

Research Questions

RQ1: How well can each of three classic media effect theories (Mood Management Theory, The Catharsis Hypothesis, or Excitation-Transfer Theory) explain the psychological effects of video-games?

If those in the nonviolent game condition report a greater reduction in stress and frustration, and a greater improvement in overall affect post-play than those in the violent game condition, then MMT would be supported. MMT would further be supported if those in the violent game condition report higher levels of arousal post-play than those in the nonviolent game condition. Conversely, if those in the violent game condition report a larger reduction in frustration or hostility post-play than those in the nonviolent game condition, The Catharsis Hypothesis would be supported. Excitation-Transfer Theory would be supported if overall affect reported post-play was positively correlated with the level of arousal reported post-play. This prediction applies mainly to the violent video-game condition, where arousal is more likely to be heightened after game play.

RQ2: Can differences in the psychological effects of video-games be explained, in part, by differences in user-experience and the gender of the player? If so, which user-experience variables are the most important for improving or repairing mood and how do males and females differ?

If user-experience variables are not important factors in predicting psychological outcomes of video-game play, then there should be little to no relationship between an individual's performance, enjoyment, and flow experience with game play and his or her psychological state after game play. Moderate or strong relationships between user-

experience variables such as performance, flow variables, and enjoyment and Post-Play affect would support the importance of these variables as predictors of psychological outcomes. Likewise, if gender is not an important predictor of psychological outcomes, then there should be little or no difference between males and females in their psychological responses to game play. Differences between males and females would suggest that gender is indeed an important variable when it comes to understanding the psychology of video-game play.

Method

Participants

Based on a power analysis with a medium effect size assumed, $\alpha = .05$, and power = .80, participants included 177 students recruited from San José State University. After Institutional Review Board (IRB) approval was received (see Appendix A), students were recruited through the SJSU Department of Psychology online recruitment system, hallway wall postings on campus, and professor announcements in psychology and statistics courses. For psychology students, partial course credit or extra credit was offered as compensation. Students from other majors who were not eligible to receive credit were entered into a raffle to win one of two $50 gift cards for GameStop.

Measures

The World Wide Web User Survey (Novak, Hoffman, & Yung, 1998) is a questionnaire designed to measure the experience of flow, affect, and arousal during web use. For the purposes of this study, the survey was modified to measure the experience of flow during video-game play. Items on the questionnaire measured *affect*, *arousal*,

dominance, focused attention, interactivity, challenge, telepresence, and *time distortion*. Arousal, dominance, affect, an focused attention were quantified using a 9-point semantic differential scale, and all other constructs were quantified using a 9-point Likert type scale with 1 denoting "very strongly disagree" and 9 denoting "very strongly agree".

Pre-play survey. The pre-play survey was comprised of 12 questions taken from Novak et al. (1998), originally acquired from the Pleasure-Arousal-Dominance Scale (Mehrabian, 1980). Using four items for each construct, the survey assessed positive and negative affect (e.g., "Satisfied vs. Unsatisfied"), self-reported physiological arousal (hereafter termed *arousal*), and dominance (e.g., "Controlling vs. Controlled"). All 12 items were presented as bipolar adjective sets, and were quantified using a 9-point semantic differential scale ranging from -4 to +4, with 0 denoting "Neutral". For analysis, these subscales were summed to create a composite variable for each construct. The survey also included two items to assess frustration and hostility. These items were quantified using a 5-point Likert type scale, with 1 denoting "very slightly or not at all" and 5 indicating "very much". Reliability for the affect, arousal, and dominance subscales are presented in Table 1.

Table 1

Pre- and Post-Play Reliability for Arousal, Affect, and Dominance

Item	Cronbach's Alpha	
	Pre-Play	Post-Play
Arousal[a]	.72	.70
1. Stimulated vs. Relaxed		
2. Excited vs. Calm		
3. Frenzied vs. Sluggish		
Affect	.84	.92
4. Happy vs. Unhappy		
5. Pleased vs. Annoyed		
6. Satisfied vs. Unsatisfied		
7. Contented vs. Melancholic		
Dominance	.69	.72
8. Controlling vs. Controlled		
9. Influential vs. Influenced		
10. Dominant vs. Submissive		
11. Autonomous vs. Guided		

[a] One item, "Aroused vs. Unaroused," was misinterpreted in pilot testing to mean sexual rather than sympathetic nervous system arousal. Due to the misunderstanding, this item was removed from analyses and is not included in the reliability coefficient for this subscale.

Post-play survey. The first section of the post-play survey included the same items presented in the pre-play survey to assess affect, arousal, dominance, frustration, and hostility. The second section of the post-play survey used items from The World Wide Web User Survey (Novak et al., 1998), a questionnaire designed to measure user-experience and flow during web usage. Challenge (e.g., "Playing the video-game challenged me"), interactivity (e.g., "There was very little waiting time between my

actions and the computer's response"), telepresence (e.g., "Playing the video-game made me forget where I was"), and time distortion (e.g., "When I was playing the game I lost track of time"), were all quantified using a 9-point Likert type scale with 1 denoting "very strongly disagree" and 9 denoting "very strongly agree". Focused attention during game play was assessed with 4 items, all using a 9 point semantic differential scale ranging from -4 to +4, with 0 indicating "Neutral" (e.g., "When I was playing the game I was: Focused vs. Not focused").

The third part of the post-play survey was designed by the researchers and used the same 9-point Likert scale ranging from 1 (very strongly disagree) to 9 (very strongly agree). The subscales assessed subjective enjoyment of the gaming experience using six items (e.g., "If given the choice, I would like to play the game again"), perceptions of performance in the game (1 item), clear in-game goals (2 items), and intuitiveness of game controls (2 items). Reliability coefficients for the user-experience subscales are presented in Table 2. In addition to the user-experience items, the third section of the post-play survey included demographic questions, and six items pertaining to video-game play habits and past experience with the test game. As with the pre-play survey, composite scores were created for each subscale by summing the responses to all items in the category after reverse scoring was done. All questionnaires and the mood-induction task were hosted on www.surveymonkey.com. The demographic and video-game experience questions are shown in Appendix D.

Table 2

Reliability for User-Experience Subscales

Item	Cronbach's Alpha
Focused Attention[a]	.78
1. Absorbed Intently vs. Not Absorbed Intently	
2. Focused vs. Not Focused	
3. Concentrating Fully vs. Not Concentrating Fully	
Challenge	.78
4. Playing the video-game challenged me.	
5. Playing the video-game challenged me to perform to the best of my ability.	
6. The video-game provided a good test of my skills.	
7. I found that playing the video-game stretched my capabilities to my limits.	
Interactivity	.71
8. There was little waiting time between my actions and the computer's response.	
9. Interacting with the video-game was slow and tedious.	
Telepresence	.77
10. I forgot about my immediate surroundings when I was playing the game.	
11. Playing the game made me forget where I was.	
Time Distortion	.73
12. Time seemed to go by very quickly when I was playing the game.	
13. When I was playing the game I lost track of time.	
Enjoyment	.88
14. I loved the feeling of playing and want to capture it again.	
15. I would recommend the game to a friend.	
16. The game wasn't really for me.	
17. If given the choice, I would like to play the game again.	
Clear Goals	.85
18. The goals of the game were clearly defined.	
19. I knew clearly what I wanted to do and achieve.	
Game Controls	.74
20. I could use the controls of the game automatically without having to think.	
21. I felt in total control of my playing actions.	

[a] One item using the term "Engrossed" was misinterpreted by participants as referring to disgust rather than attention and was removed from the analyses. The removed item is not included in the reliability coefficient for this subscale.

Mood-Induction Procedure

This study included a mood-manipulation procedure to induce stress and frustration. Consistent with previous mood management research, the frustration task involved a set of difficult logic puzzles designed to exceed the abilities of the participants (Bryant & Zillmann, 1984; Mastro, Eastin, & Tamborini, 2002).

The participants were told that the logic problems were taken from a variety of basic intelligence tests. At the same time, they were told that each problem used information learned in a K-12 education, and that college students tended to score higher than the general population. They were given 10 min to complete as many problems as they could "correctly." A timer that counted down from 10 min was set in front of the participant, and the researcher remained in the room during the test to remind the participants of their remaining time at the 5 and 1 min marks. Participants were given a chance to ask questions only before the timer was started, and not during the test. Any questions asked during the test were met with the default response, "just do your best."

Video-Games

Two video-games were used in this study, both of which were played using a Dell or custom made desktop PC with a 17 in Dell monitor. Participants sat approximately 61 cm from the computer monitor and wore Sennheiser HD202 headphones during game play. The violent video-game, *Call of Duty: Black Ops (Call of Duty)* is a first-person shooter video-game with realistic graphics released by Activision in November 2010. In *Call of Duty*, the player character is a soldier armed with two guns, and the primary goal is to kill all other opposing forces. *Call of Duty: Black Ops* is rated *M* for blood, gore,

and intense violence. There are a number of game types available in *Call of Duty: Black Ops* and the player character is highly customizable. All participants played the same game type using the same settings, and each participant played the same character, which had been custom created before the start of data collection. The game type played by all participants was "Combat Training: Team Deathmatch". In combat training, the player character's allies and enemies are both computer generated, as opposed to online matches wherein the player's allies and enemies are other online players of varying skills levels. "Team Deathmatch" is a type of match that includes two opposing teams of soldiers, with the overall goal of scoring more kill points than the other team.

The nonviolent video-game, *Portal*, is a self-paced problem solving game that features realistic graphics and a first-person perspective. The game was released in October of 2007 by *Valve Software. Portal* was selected due to its similarity to *Call of Duty* in terms of graphics, colors, and perspective. The game is rated *T* and does not involve violent objectives. In place of a gun containing bullets, the player character in *Portal* is armed with a device that creates portals on certain surfaces. The primary goal in the game is to place the portals in the correct order and in the correct locations to solve the puzzle chamber. Although *Call of Duty: Black Ops* and *Portal* are both available for Xbox 360 and PlayStation 3, the PC versions of the games were used in this experiment due to the relative ease of game play offered by PC controls for those who are unfamiliar with the controls of a specific gaming system.

Procedure

The procedure followed for this study is presented in Figure 1. Upon arrival, participants were randomly assigned to one of two games. Eighty-eight participants were assigned to play *Portal*, and 89 were assigned to play *Call of Duty*. Participants sat in a private testing room for the duration of the study. In order to reduce distractions, the researchers asked the participants to leave their personal belongings outside the testing room, including any electronic devices. Participants sat in front of the computer and reviewed the consent form (Appendix B). If the participants gave their informed consent they would advance to the introductory page of the logic test. After the logic test was administered, the researcher informed the participants that they would receive their test results later, and requested that they advance to the next browser tab containing the pre-play survey. The participants filled out the survey and alerted the researcher when they were finished. In order to reduce possible bias, the researcher and assistants followed a detailed script to ensure equal treatment of all participants.

After completing the pre-play survey, each participant began his or her assigned game condition. Before playing the assigned game, all participants listened to the researcher read a brief synopsis of the video-game they were about to play. The synopsis described the premise of the game and the main goals involved. For the first 5 min of the game play session, participants received instructions on how to use the game controls. A sheet of paper that listed the main controls of the game was placed next to the computer monitor for reference during game play. During the 5 min training period, participants were allowed to ask for clarification on game elements or ask for assistance on controls.

After the 5 min training period, participants were left alone in the room to play the assigned game for 15 min.

After the game session was over, the researcher entered the room, informed the participant that the play session was over, and took a screenshot of the participant's performance. The researcher then brought up the post-play survey, and asked the participant to complete the items and to inform the researcher when they were done. As with the pre-play survey, each participant filled out the items without the researcher present. Participants were allowed to take their time responding to the questions and were encouraged to ask for clarification on any survey items they did not understand. The debriefing form (Appendix C) was displayed after the final page of the post-play survey. The debriefing form explained that the logic problems used in the assessment portion were in fact designed to exceed the capabilities of college students and that performance on the test did not actually reflect intelligence.

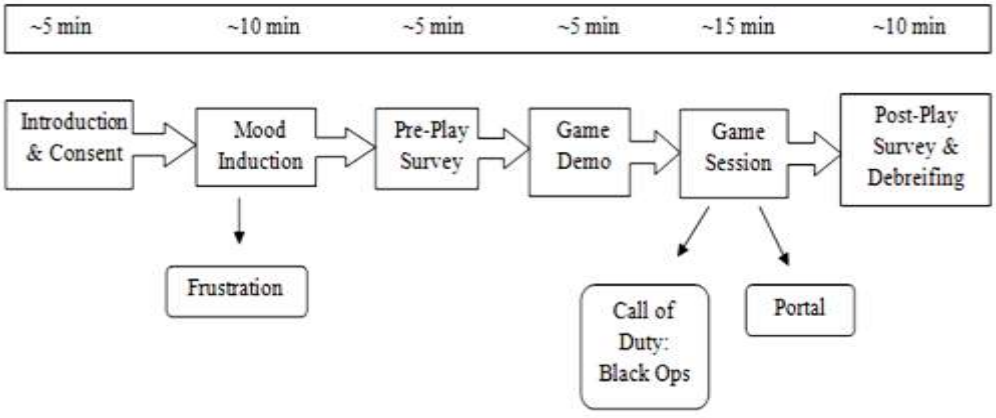

Figure 1. Procedure timeline and measures.

Results

Although 177 participants were recruited, one participant was excluded due to technical difficulties, five participants were excluded due to motion sickness, and another 15 participants were excluded for failing to meet the study participation requirements (e.g., skipping a large number of survey items). Therefore, data from 156 participants were included in the final analyses. All data analysis was done using PASW version 18.

Demographics and Video-Game Habits

Detailed demographics by condition are displayed in Table 3. The sample included both male (61%) and female (39%) university students ages 18-35. The sample was 43% Asian/Pacific Islander, 31% White/Caucasian, 17% Hispanic/Latino, 5% Mixed Race, and 5% African-American. In terms of past video-game experience, most participants were relatively experienced players, with an average of 10.50 (*SD* = 4.60) years of video-game experience. In terms of genre preference, the most popular game type reported overall was first-person shooter (31%). The second most popular game type was casual games (15%), followed by role-playing games (14%), action-adventure games (11%), simulation games (8%), strategy games, (6%), and serious/educational games (2%).

Table 3

Participant Demographics by Game Condition

Variable	Nonviolent Percentage (n)	Violent Percentage (n)	Total Percentage (n)
Age			
18-23	92.1 (70)	87.2 (68)	89.6 (138)
24-29	6.5 (5)	11.6 (9)	8.9 (14)
30-35	1.3 (1)	1.3 (1)	1.2 (2)
Gender			
Male	67.5 (52)	54.4 (43)	60.9 (95)
Female	32.5 (25)	45.6 (36)	39.1 (61)
Ethnicity			
Asian/Pacific Islander	42 (32)	44 (35)	43 (67)
Black/African American	5 (4)	4 (3)	5 (7)
Hispanic/Latino	14 (11)	20 (16)	17 (27)
White/Caucasian	35 (27)	27 (21)	31 (48)
Other	4 (3)	5 (4)	5 (7)

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition. Values may not sum to 100% due to rounding.

There were a number of gender differences in terms of video-game habits. Males reported more years of lifetime video-game experience (M = 11.95, SD = 4.14 for males vs. 8.20, SD = 4.33 for females), and many more hours per week of game play for first-person shooters and other video-games containing violence. Weekly hours of game play for nonviolent video-games were much more similar, but males still played slightly more on average, compared to females. Game genre preferences also differed between males and females. The most popular game types among females were casual games such as *Angry Birds* and *Farmville*, and simulation games like *The Sims* and *Rockband*, whereas the most popular game type among males was first-person shooter. Participant video-game habits by gender are displayed in Table 4.

Table 4

Participant Video-game Habits by Gender

Variable	Females Mean (SD)/ Percentage	Males Mean (SD)/ Percentage	Total Mean (SD)/ Percentage
Hours of Game Play per Week			
First-Person Shooters	0.89 (1.87)	4.59 (5.21)	3.14 (4.59)
Violent Games	2.00 (3.59)	6.60 (6.80)	4.80 (6.17)
Nonviolent games	4.34 (4.84)	4.91 (15.85)	4.66 (12.66)
Game Type Played Most Often			
Action/Adventure	10%	11%	10%
Shooter	18%	40%	31%
Role-Playing	7%	19%	14%
Simulation	21%	0%	8%
Strategy	0%	10%	6%
Sports	5%	18%	13%
Serious/Educational	5%	0%	2%
Casual	34%	3%	15%

Note. n = 95 for males, n = 61 for females. Values may not sum to 100% due to rounding.

Manipulation Check

To ensure that the mood manipulation procedure did induce frustration and stress, pre-play ratings of stress and frustration following the mood-induction procedure were examined. Indeed, participants indicated moderate levels of frustration prior to playing the assigned game (an average rating of 2.67, out of 5). The level of frustration induced by the procedure did not differ between the two game groups, $t(154) = .85$, $p = .40$, two-tailed, and did not differ between genders, $t(154) = .80$, $p = .43$, two-tailed. Stress induced by the mood manipulation procedure was slightly less pronounced than frustration, but still above neutral, with an average pre-play score of 1.01 on a scale ranging from -4 to +4, with -4 denoting "Calm" and +4 denoting "Stressed". As with the induced frustration, the amount of stress reported by participants after the mood manipulation procedure did not differ across groups, $t(154) = .08$, $p = .94$, two tailed, nor between genders, $t(154) = 0.78$, $p = .44$, two-tailed. Overall, the mood-induction procedure was successful in eliciting the intended mood states of stress and frustration, with no significant differences between the game conditions, and no notable difference between genders.

Effect of Game Type and Gender on Stress and Frustration

MMT would predict that participants in the nonviolent game condition would show a greater decrease in stress and frustration from pre- to post-play than participants in the violent game condition. Two three-factor mixed ANOVAs were conducted to investigate this assumption and to examine the effect of game type and gender on stress and frustration. Pre- and post-play measures of stress and frustration were used as the

within-subjects factors, and game type and gender were used as the between-subjects factors. Table 5 displays mean pre- and post-play scores for frustration and stress by game condition.

Table 5

Mean Pre- and Post-Play Frustration and Stress Scores by Game Condition

	Nonviolent	Violent	Total
Variable	Mean (*SD*)	Mean (*SD*)	Mean (*SD*)
Frustration			
Pre-Play	3.07 (1.38)	2.87 (1.43)	2.97 (1.40)
Post-Play	1.62 (1.04)	1.55 (0.75)	1.59 (0.90)
Stress			
Pre-Play	1.03 (2.03)	1.00 (2.25)	1.01 (2.14)
Post-Play	-1.78 (2.00)	-1.10 (1.87)	-1.44 (1.96)

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.

As shown in Table 6, results of the first analysis showed that there was a significant effect of time on frustration, with both game conditions showing a large decrease in frustration from pre- to post-play, $t(154) = 11.01$, $p < .001$, two-tailed, Hedges' $g = 0.99$. There was no significant effect of game type or gender on frustration level, and no significant interaction between game type and time. There was, however, a significant interaction between time and gender (Figure 2). On average, males reported

more frustration before game play, but less frustration after game play, when compared to females.

Table 6

ANOVA Results for Frustration

Effect	*F*	*df*	*p*
Within-Subjects			
Time	101.24***	1	< .001
Time x Gender	5.87*	1	.02
Time x Game Type	0.09	1	.77
Time x Gender x Game Type	5.35*	1	.02
Between-Subjects			
Gender	0.77	1	.38
Game Type	0.66	1	.42
Gender x Game Type	1.41	1	.24

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

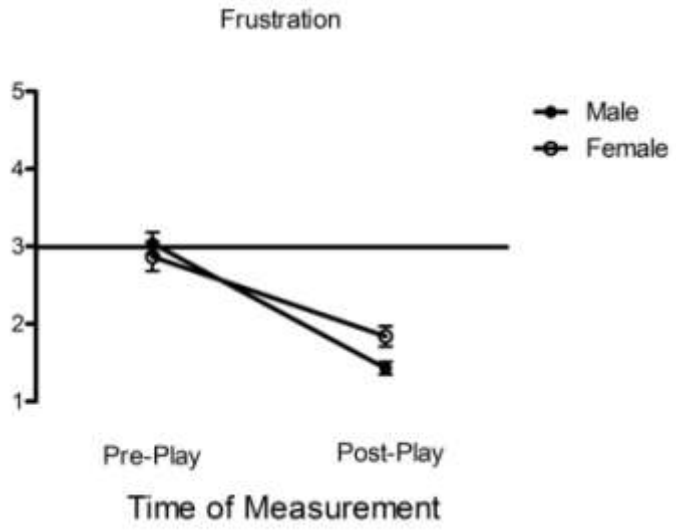

Figure 2. Interaction between mean self-reported frustration scores and gender. Error bars represent ±1 *SE*.

Additionally, there was a significant three-way interaction between time, gender, and game type. As shown in Figure 3, females in the nonviolent game condition showed significantly lower levels of frustration before game play (M = 2.64, SD = 1.41) compared to males (M = 3.29, SD = 1.33), $t(75) = 1.96$, p =.05, two-tailed, Hedges g = 0.48. However, the initial gender difference in frustration within the nonviolent game condition reversed after game play, with males reporting significantly less frustration post-play (M = 1.44, SD = 0.89), than females reported (M = 2.00, SD = 1.22), $t(36)$ = 2.26, p = .05, two-tailed, Hedges' g = 0.56. In sum, frustration decreased significantly from pre- to post-play for all participants, but this decrease was more pronounced in males than in females, especially in the nonviolent game condition.

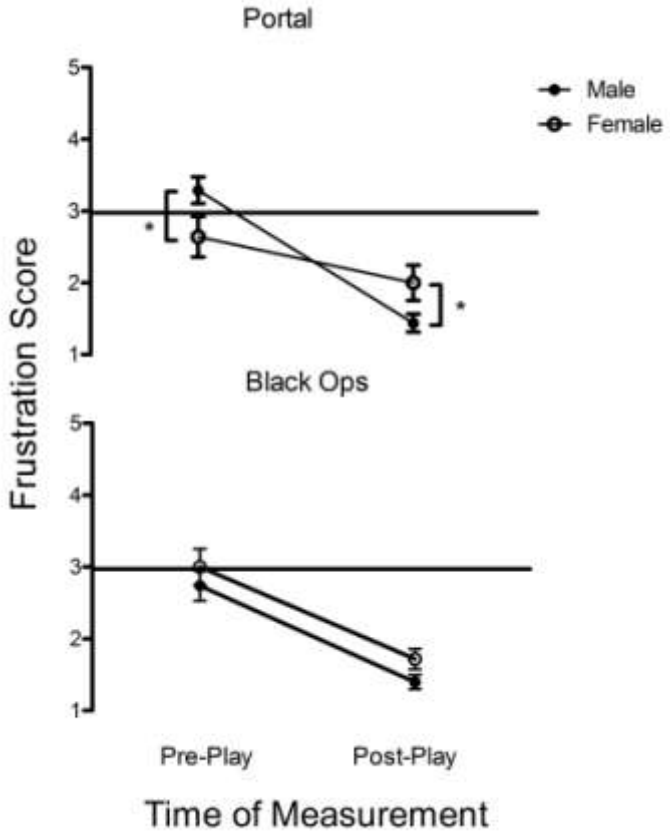

Figure 3. Mean frustration scores for males and females in the violent and nonviolent game conditions. Error bars represent ±1 *SE*.

A second three-factor mixed ANOVA (see Table 7) demonstrated that there was a significant main effect of time on stress level, with participants reporting slight to moderate levels of stress after the mood-induction (M = 1.01, SD = 2.14), and much lower levels of stress after game play (M = -1.44, SD = 1.96), $t(155) = 11.48$, $p < .001$, two-tailed, Hedges' g = 1.16. No significant interaction was found between pre- and post-play stress levels and game type, meaning that the two game conditions did not differ in the amount of stress reduction that occurred from pre- to post-play.

Table 7

ANOVA Results for Stress

Effect	*F*	*df*	*p*
Within-Subjects			
Time	114.75***	1	< .001
Time x Gender	1.99	1	.16
Time x Game Type	0.93	1	.34
Time x Gender x Game Type	4.65*	1	.03
Between-Subjects			
Gender	5.00*	1	.03
Game Type	0.63	1	.43
Gender x Game Type	0.76	1	.38

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.
* $p < .05$, ** $p < .01$, *** $p < .001$.

As shown in Figure 4, a significant main effect was found for gender, with females in both game conditions reporting significantly higher levels of stress after game play ($M = -0.89$, $SD = 1.97$), compared to males ($M = -1.79$, $SD = 1.88$), $t(154) = -2.88$, $p < .01$, two-tailed, Hedges' $g = 0.47$. There was also a significant three-way interaction between time, gender, and game type (Figure 5) with females in the nonviolent game condition showing significantly higher self-reported stress levels after game play (M = -

.72, *SD* = 2.03) than males in the same condition (*M* = -2.29, *SD* = 1.80), *t*(75) = -3.44, *p* < .01, two tailed, Hedges' *g* = 0.84. These effects demonstrate that both game conditions decreased in stress from pre- to post-play, and that the decrease was greater for males than for females overall. The greater reduction in stress reported by males was especially evident in the nonviolent game condition, where females reported significantly higher post-play stress levels compared to males.

Altogether, both stress and frustration decreased significantly from pre- to post-play. The changes from pre- to post-play did not differ between the violent and nonviolent game conditions, but there were some significant differences between males and females, especially in the nonviolent game condition. Females, overall, reported higher levels of stress after game play than males reported, and despite starting with slightly lower levels of frustration, ended up above males after game play in the nonviolent game condition. In terms of the noxious mood states of stress and frustration, these findings do not support the hypothesis put forth by MMT that those in the nonviolent game condition would experience a greater reduction in negative mood state from before to after game play.

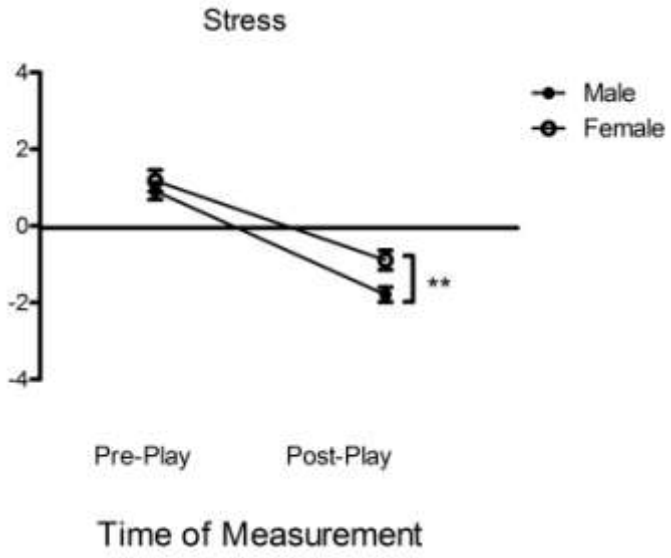

Figure 4. Mean stress scores for males and females. Error bars represent ±1 *SE*. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

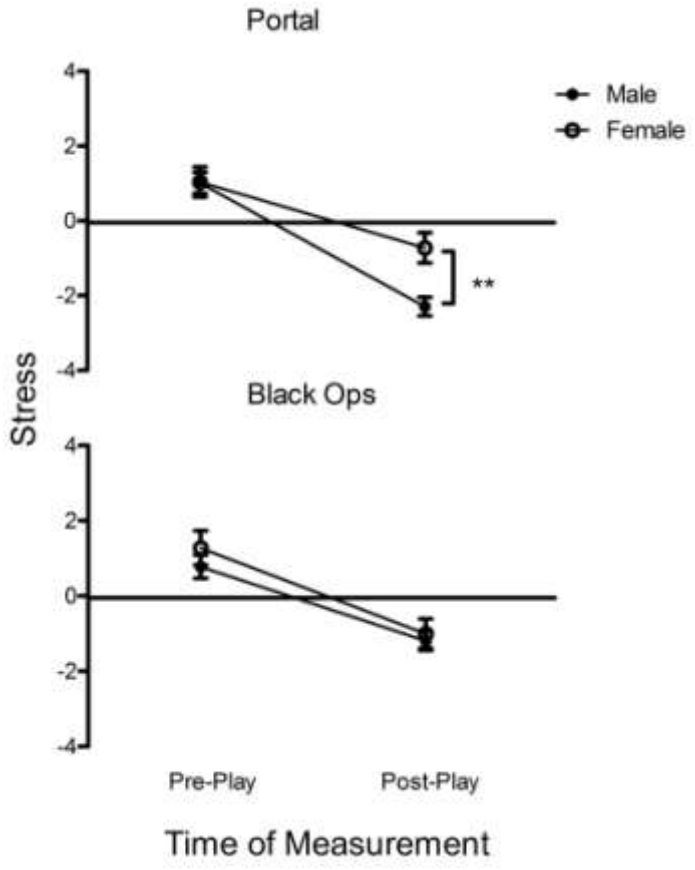

Figure 5. Mean stress scores for males and females in the violent and nonviolent game conditions. Error bars represent ±1 *SE*.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Effect of Game Type and Gender on Mood

To further explore the assumptions of MMT, and to investigate the effect of video-game type (violent or nonviolent) and gender on overall mood, arousal, and dominance, a series of three-factor mixed ANOVAs were conducted. Each ANOVA used pre- and post-play scores as the within-subject factor. Game type and gender were

used as the between-subjects factors. Mean affect, arousal, and dominance scores for pre- and post-play are presented in Table 8.

Table 8

Mean Pre- and Post-Play Affect, Arousal and Dominance Scores by Game Condition

	Nonviolent	Violent	Total
Variable	Mean (*SD*)	Mean (*SD*)	Mean (*SD*)
Affect			
Pre-Play	-2.10 (6.14)	-1.22 (5.64)	-1.65 (5.89)
Post-Play	6.99 (6.39)	7.53 (5.43)	7.26 (5.91)
Arousal			
Pre-Play	0.03 (4.73)	-0.96 (5.01)	-0.47 (4.88)
Post-Play	3.04 (4.71)	4.54 (5.43)	3.80 (5.18)
Dominance			
Pre-Play	-1.51 (3.88)	-1.10 (4.50)	-1.30 (4.20)
Post-Play	3.47 (4.27)	3.71 (4.24)	3.59 (4.24)

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.

In terms of positive and negative affect, MMT would predict that participants in the nonviolent game condition (no semantic affinity) would experience more mood repair than would participants in the violent game condition (semantic affinity). As shown in Table 9, results revealed a significant main effect of time, with both the violent and nonviolent game conditions showing large improvements in mood from before to after

game play, $t(155) = 13.40$, $p < .001$, two-tailed, Hedges' $g = 1.51$. There was no significant effect of game type on affect, and no significant interaction between time and game type, denoting that the two game conditions did not differ in pre- or post-play affect. The effect of gender on affect and the interaction between game type and gender were both non-significant, meaning that overall pre- and post-play affect did not differ between males and females. However, there was a significant three way interaction between time, game type, and gender, with males in the nonviolent game condition showing significantly more negative affect before game play ($M = -3.33$, $SD = 6.26$) compared to females in the nonviolent game condition ($M = 0.44$, $SD = 5.12$), $t(75) = -2.62$, $p < .05$, two-tailed, Hedges' $g = 0.63$.

Table 9

ANOVA Results for Affect

Effect	*F*	*df*	*p*
Within-Subjects			
Time	157.58***	1	< .001
Time x Gender	1.00	1	.32
Time x Game Type	.19	1	.66
Time x Gender x Game Type	6.45*	1	.02
Between-Subjects			
Gender	1.46	1	.23
Game Type	.50	1	.48
Gender x Game Type	.56	1	.46

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Although there was an unexpected significant difference between males and females before game play in the nonviolent game condition, gender differences in post-play affect were in the opposite direction, with males showing slightly more positive affect after game play than females showed. As shown in Figure 6, all participants (regardless of game type or gender) experienced a significant improvement in mood after playing a video-game. The only other significant difference found for affect was between

males and females in the nonviolent game condition, where males reported more negative affect before game play, but more positive affect after game play compared to females. These results do not support the MMT assumption that the nonviolent condition would report more mood improvement when compared to the violent game condition. On the contrary, the two conditions reported very similar improvements in mood from pre- to post-play.

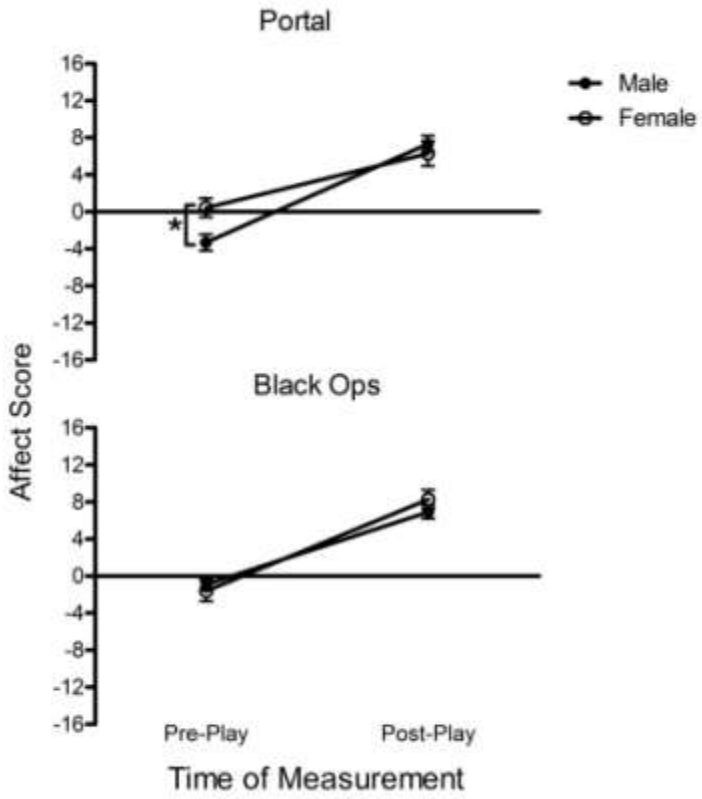

Figure 6. Mean affect scores for males and females in the violent and nonviolent game conditions. Error bars represent ±1 *SE*.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Effect of Game Type and Gender on Arousal

To assess changes in arousal level, a three-factor mixed ANOVA was performed using pre- and post-play measures as the within-subjects factor, and game type and gender as the between-subjects factors. MMT and other past research would predict that the violent game condition would result in more arousal post-play than the nonviolent game condition. As displayed in Table 10, results showed a main effect of time on arousal level, $t(155) = 8.31$, $p < .001$, two-tailed, Hedges' $g = 0.88$, and a significant interaction between time and game type. In other words, arousal increased significantly in both game conditions but the conditions differed from one another in the level of arousal reported from pre- to post-play. More specifically, before game play, those in the nonviolent game condition reported slightly lower levels of arousal than did those in the violent game condition. After game play, however, those in the violent game condition reported higher levels of arousal than those in the nonviolent game condition reported. This interaction is displayed in Figure 7.

Table 10

ANOVA Results for Arousal

Effect	*F*	*df*	*p*
Within-Subjects			
Time	74.20***	1	< .001
Time x Gender	4.79*	1	.03
Time x Game Type	5.00*	1	.03
Time x Gender x Game Type	.31	1	.58
Between-Subjects			
Gender	5.29*	1	.02
Game Type	.31	1	.58
Gender x Game Type	4.18*	1	.04

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

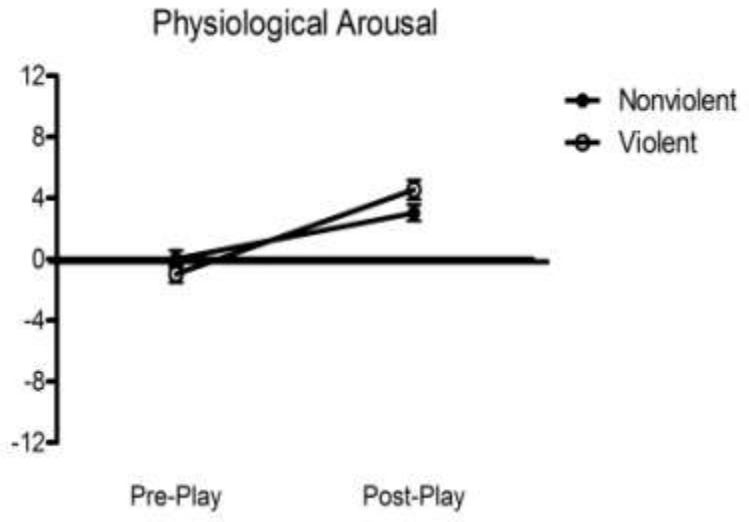

Figure 7. Interaction between mean arousal scores and game type (violent or nonviolent). Error bars represent ±1 *SE.*

Interestingly, males and females differed in the amount of arousal reported. There was a significant main effect of gender on arousal, with females in both game conditions reporting higher levels of arousal after game play (M = 5.54, SD = 3.84) than males reported (M = 2.68 SD = 5.62), $t(153) = 3.77$, $p < .001$, two-tailed, Hedges' $g = 0.57$. There was also a significant interaction between gender and game type on arousal following game play, with females in the violent game condition reporting significantly higher levels of arousal after game play (M = 6.81, SD = 3.13) than were reported by males in the same condition (M = 2.65, SD = 6.36), $t(63) = 3.77$, $p < .001$, two-tailed, Hedges' $g = 0.87$. As shown in Figure 8, participants in both the violent and nonviolent game conditions showed an increase in arousal level from pre- to post-play, but the largest increase in arousal occurred in the violent game condition. Furthermore, females experienced more arousal after game play than did males in both conditions, but particularly after playing the violent game. These findings are somewhat consistent with

the assumptions put forth by MMT and past research that participants in the violent game condition would experience more arousal after game play, however this was only true for females who played a violent game, and not for males.

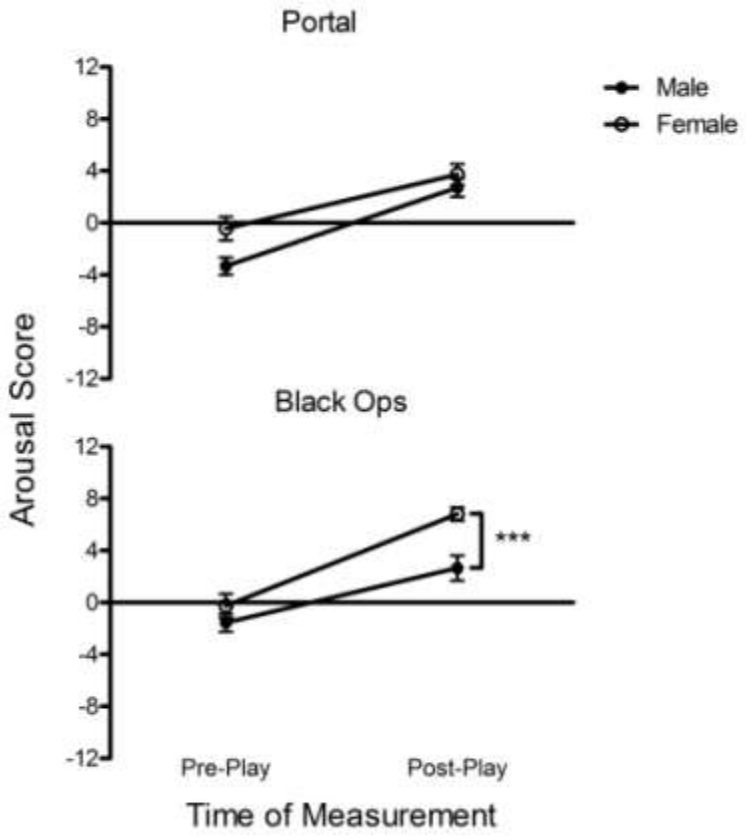

Figure 8. Mean arousal scores for males and females in the violent and nonviolent game conditions. Error bars represent ±1 *SE*.
Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Effect of Game Type and Gender on Dominance

To explore the effect of game type and gender on dominance level, a three-factor mixed ANOVA was conducted using pre- and post-play measures as the within-subject factor and game type and gender as the between-subjects factors. As shown in Table 11, results showed that there was a significant effect of time on dominance, with both conditions increasing in feelings of dominance from before to after game play, $t(155) = 10.02$, $p < .001$, two-tailed, Hedges' $g = 1.16$. There was no significant effect of game type on dominance and no significant interaction between time and game type, demonstrating that all participants increased in feelings of dominance from pre- to post-play regardless of the game they played. Moreover, the effect of gender was non-significant, as was the interaction between gender and game type, implying that males and females did not differ in the amount of dominance they reported feeling before and after game play. As pictured in Figure 9, participants showed an increase in perceived dominance from before to after game play, regardless of game type or gender.

Table 11

ANOVA Results for Dominance

Effect	*F*	*df*	*p*
Within-Subjects			
Time	85.82***	1	< .001
Time x Gender	.89	1	.35
Time x Game Type	.09	1	.77
Time x Gender x Game Type	2.37	1	.13
Between-Subjects			
Gender	.03	1	.87
Game Type	.25	1	.62
Gender x Game Type	.69	1	.41

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

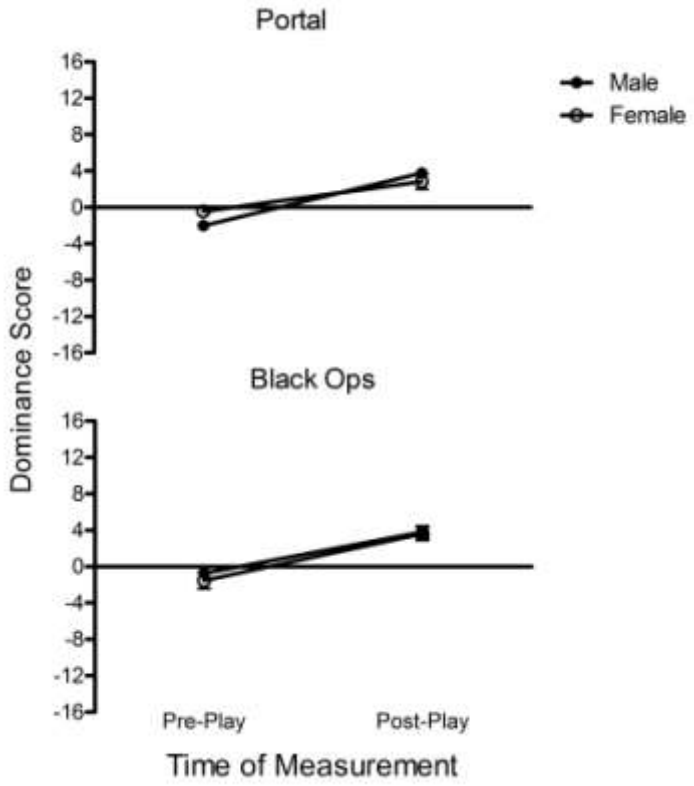

Figure 9. Mean dominance scores for males and females in the violent and nonviolent game conditions. Error bars represent ±1 *SE*.

The Effect of Game Type and Gender on Hostility

Another three-factor mixed ANOVA was conducted in order to test the assumptions of The Catharsis Hypothesis, and to investigate the effect of game type (violent or nonviolent) and gender on feelings of hostility. The Catharsis Hypothesis would predict that participants in the violent game condition would show a greater decrease in hostility when compared to participants in the nonviolent game condition. Pre- and post-play measures of hostile feelings were entered as the within-subjects factor and game type and gender were entered as the between-subjects factors. As shown in Table 12, results revealed a significant effect of time on hostility, indicating that hostile

feelings decreased in both groups, with all participants reporting less hostility after game play than before game play, $t(155) = 2.59$, $p < .01$, two-tailed, Hedges' $g = 0.23$. There was no significant effect of game type, and no significant interaction between time and game type, meaning that the violent and nonviolent game conditions did not differ from one another in terms of how hostile they reported feeling before or after game play. The effect of gender was non-significant, and there was no significant interaction between gender and game type, showing that males and females were not significantly different in the amount of hostility they reported before or after game play. As shown in Figure 10, the results indicate that all participants experienced a decrease in hostile feelings from before to after game play, regardless of gender or violent game content. These findings do not support The Catharsis Hypothesis prediction that participants in the violent game condition would report feeling less hostile after game play compared to the nonviolent game condition. In fact, the decrease in hostility reported in the violent game condition was no greater than the decrease reported in the nonviolent game condition.

Table 12

ANOVA Results for Hostility

Effect	*F*	*df*	*p*
Within-Subjects			
Time	5.54*	1	.02
Time x Gender	.12	1	.73
Time x Game Type	.15	1	.70
Time x Gender x Game Type	.12	1	.73
Between-Subjects			
Gender	.42	1	.52
Game Type	.84	1	.36
Gender x Game Type	1.68	1	.20

Note. $n = 79$ for violent game condition, $n = 77$ for nonviolent game condition.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

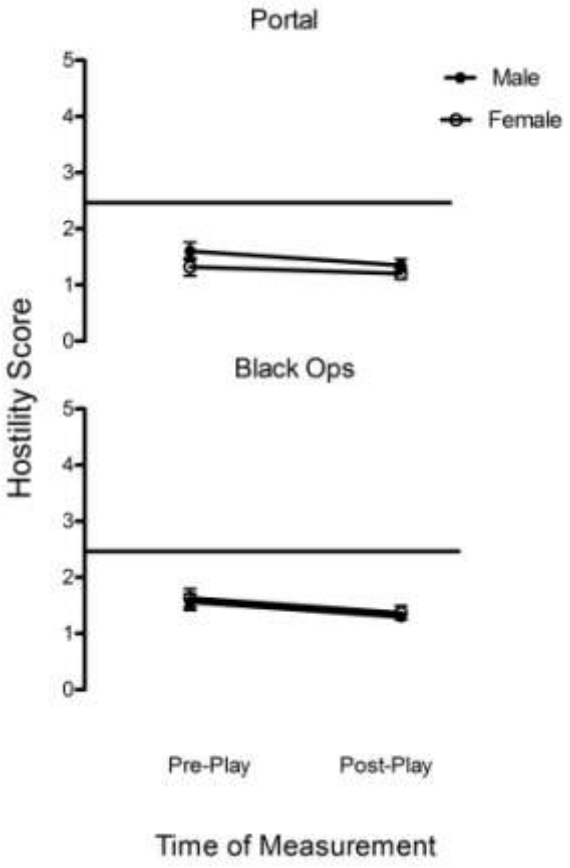

Figure 10. Mean hostility scores for males and females in the violent and nonviolent game conditions. Error bars represent ±1 *SE*.

Game Type and the Relationship between Arousal and Affect

Excitation-Transfer Theory would predict that for the violent game condition, affect and arousal would be positively correlated. To test this assumption, linear regression was performed for both the violent game condition and the nonviolent game condition using post-play affect as the dependent variable, and post-play arousal as the independent variable. For the violent game condition, there was a significant positive correlation between post-play affect and post-play arousal, (r (1,77) = .30, $p < .01$, two-tailed). However, the correlation between post-play arousal and post-play affect was not

significant for the nonviolent game condition, (r (1,75) = .19, p > .05, two-tailed). For those who played a violent game, affect became significantly more positive as arousal increased, but this was not the case for the nonviolent game condition. This finding supports the Excitation-Transfer Theory prediction that affect for participants in the violent game condition would be partially predicted by arousal level.

User-Experience and Gender

To address the second research question of whether or not user-experience variables and gender would be able to explain, in part, differences in the psychological effects of video-games, a hierarchical multiple regression analysis was conducted. Pearson's correlations were performed using all variables of interest, with post-play affect scores as the criterion variable. The predictor variables were game type, gender, and all nine user-experience variables (focused attention, challenge, interactivity, telepresence, time distortion, enjoyment, performance, clear goals, and game controls).

As seen in Table 13, Pearson's correlations revealed significant positive correlations between post-play affect scores and all nine user-experience variables. Enjoyment and game performance emerged as the most important individual predictors of post-play affect, followed by focused attention, interactivity, and game controls. Challenge, clear goals, time distortion, and telepresence were also significant individual predictors of post-play affect. These correlations indicate that a more positive user-experience in terms of these variables was associated with more positive affect after game play.

Table 13

Correlations Among Independent Variables and Post-Play Affect

	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1.	Post-Play Affect	__	.41**	.29**	.21**	.26**	.29**	.53**	.51**	.29**	.32**	.05	.03
2.	Focused Attention		__	.40**	.25**	.34**	.24**	.42**	.31**	.23**	.21**	-.12	.06
3.	Challenge			__	.12	.35**	.18	.28**	.08	.06	.09	-.02	.30**
4.	Interactivity				__	.17*	.33**	.40**	.31**	.33**	.44**	-.09	.03
5.	Telepresence					__	.33**	.31**	.18*	.09	.09	.14	.21**
6.	Time Distortion						__	.30**	.22**	.32**	.24**	.06	.10
7.	Enjoyment							__	.56**	.41**	.36**	.01	-.08
8.	Performance								__	.28**	.48**	-.10	-.33**
9.	Clear Goals									__	.47**	.14	-.03
10.	Game Controls										__	-.14	-.19*
11.	Game Type											__	.13
12	Gender												

Note. Male = 1, Female = 2. N = 156 for focused attention, challenge, time distortion, telepresence, and game type. N = 155 for game controls, enjoyment, and interactivity. N = 154 for performance and clear goals.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Not surprisingly, many of the user-experience variables were significantly correlated with one another. For example, performance in the video-game was highly correlated with ease of use when it came to game controls, and there was a positive correlation between challenge and focused attention. Although there was some multicollinearity present among the independent variables, all tolerance levels were greater than .87, meaning that the predictor variables, although related, were not redundant and could all be included as separate predictor variables in the analysis.

Interestingly, gender was significantly correlated with a number of user-experience variables. The positive correlation between gender and challenge indicates that females felt more challenged by the video-game they played than did males. As evidenced by the significant negative correlation between gender and performance and gender and game controls, females felt worse about their performance in the game and found the controls less intuitive than did males. Additionally, females were more likely to report feeling immersed in game play (telepresence). There was no significant correlation between gender or the type of game played (violent or nonviolent) and post-play affect, and no significant correlations between game type and any user-experience variables. This means that a more positive or more negative user-experience was not linked to one game type over another, although males and females differed in their overall experience in terms of these variables.

For the main analysis, game type was entered into step 1, because game type (nonviolent or violent) has been considered an important predictor of psychological outcomes in past research. In step 2, gender was entered, because both previous and

current evidence suggest that males and females may respond differently to different types of media. The nine user-experience variables (focused attention, challenge, interactivity, telepresence, time distortion, enjoyment, performance, clear goals, and game controls) were entered into step 3, in order to assess the additional effects of these newer, interactive media specific factors on mood after video-game play. As seen in Table 14, results of step 1 of the hierarchical multiple regression analysis revealed that video-game type was only able to account for less than 1% of the variance in post-play affect, $R^2 = < .01$, $R^2_{adj} = < .01$, $F(1,147) = 0.44$, $p = .40$.

Table 14

Summary of Hierarchical Multiple Regression Analysis to Predict Post-Play Affect

Variable	Regression Coefficient	ΔR^2	Overall R^2
Step 1: Game Type			
Violent or Nonviolent	.05		< .01
Step 2: Gender			
Male or Female	.01	< .01	< .01
Step 3: User-Experience			
Focused Attention	.14		
Challenge	.08		
Interactivity	- .13		
Telepresence	.01		
Time Distortion	.10		
Enjoyment	.26**		
Performance	.36***		
Clear Goals	.02		
Game Controls	.07		
		.43***	.44

Note. N = 156 for Focused Attention, Challenge, Time Distortion, Telepresence, and Game Type. N = 155 for Game Controls, Enjoyment, and Interactivity. N = 154 for Performance and Clear Goals. ** $p < .01$, *** $p < .001$

Step 2 of the analysis showed that gender was not a significant predictor of post-play affect, accounting for no more variance in post-play affect than game type, $\Delta R^2 = <$ .01, $R^2_{adj} = -.01$, $F(1,146) = 0.03$, $p = .87$. Results of step 3 of the hierarchical multiple regression revealed that as a group, the nine user-experience variables were able to significantly predict mood after game play, $\Delta R^2 = .43$, $R^2_{adj} = .39$, $F(1,137) = 11.76$, $p <$ .001. Furthermore, user-experience variables were able to explain about 43% of the variance in post-play affect. As noted previously, all nine user-experience variables (focused attention, challenge, interactivity, telepresence, time distortion, enjoyment, performance, clear goals, and game controls) were significantly and positively correlated with mood following game play. However, due to colinearity among the independent variables, only enjoyment, $\beta = .26$, $t = 2.80$, $p < .01$, and performance, $\beta = .36$, $t = 4.00$, $p < .001$ emerged as significant *unique* predictors of post-play affect.

Overall, user-experience variables were able to explain much more of the variance in mood after video-game play (43%) than game type was able to explain alone, and more than game type and gender combined. All nine user-experience variables were significant independent predictors of post-play affect, with game enjoyment and performance emerging as the most important predictors due to the individual and unique contribution of each to the model.

Discussion

In this study, three media effect theories (Mood Management Theory, The Catharsis Hypothesis, Excitation Transfer) were compared and contrasted in terms of their accuracy in explaining the psychological effects of video-game play. Gender and user-experience variables were also examined as potential predictors of post-play affect.

Mood Management, Catharsis, and Excitation-Transfer

Classic Mood Management Theory, based upon the underlying assumption that human behavior is hedonistic, proposes that an aversive mood state is best repaired by exposure to highly absorbing media that (a) is excitationally opposite to the aversive mood state, (b) has positive hedonic value, and (c) has minimal semantic affinity with the prevailing noxious mood state (Zillmann, 2000, as cited by Knobloch-Westerwick, 2006). Zillmann (1998) proposed four dimensions of media content (excitatory potential, absorption potential, semantic affinity, and hedonic valence), all of which may differentially influence the mood repair potential of a specific medium. Mood Management Theory was the first of three media effect theories examined in the present study, and the four assumptions of the theory found differing levels of support, although the theory as a whole remains unsupported.

First, the absorption potential of video-games was supported by the finding that individuals in both video-game conditions, regardless of gender, showed positive shifts in affect, arousal, and dominance from pre- to post-play. Regardless of content, it appears that video-game play interrupted cognitive rehearsal enough to repair mood in both males and females. Furthermore, the semantic affinity between the prevailing noxious mood

state of frustration and the content of the violent game did not significantly impact the absorption potential of the game. In other words, contrary to some prior research (e.g., Bryant & Zillmann, as cited by Donohew, Sypher, & Higgins, 1988), the violent content of the first-person shooter video-game did not negate its mood repair potential as the theory predicted; both conditions showed equal psychological improvement.

The hedonic valence or "pleasantness" of this media type seems to be rather subjective as well. If all participants found this game type to be highly unpleasant, it is unlikely that first-person shooters would be so popular among college students and equally unlikely that participants in the violent game condition would have shown an improvement in affect. Playful types of violent media (where there is no real life harm involved) may not be perceived as negative by all individuals and may even be perceived as more exciting by some (Zillmann & Knobloch, 2001). Indeed, prior research suggests that fast paced and/or violent media lead to greater excitation (e.g., Anderson & Bushman, 2001; Bushman & Huesmann, 2006; Knobloch-Westerwick, 2006). In the present study, however, males and females differed in this domain.

On the one hand, males in both game conditions showed an increase in arousal, a result that differs from the previous finding that cardiovascular activity increases according to game violence (Ballard & Wiest, 1996). On the other hand, females in both game conditions reported significantly more arousal than did males, and this was especially true in the violent game condition. It may be that a first-person perspective (used in both games) elicits more arousal than other perspectives (e.g., third person), or

the present results may differ from past studies due to differences in methodology (i.e., the presence of a mood-induction prior to game play).

The gender differences suggest that females adhere to the excitatory potential assumption of MMT more than males do, showing higher arousal in response to violent media. One possible explanation for this gender difference is that females reported less prior experience with violent video-games. Lack of prior experience with the game type would have made the game play session a more novel experience, perhaps enhancing excitatory responses. Additionally, the percentage of females who reported favoring the shooter genre was far lower than the percentage of males who favored the genre. The higher arousal reaction for females may have been due in part to discomfort with the content and/or fast-paced nature of the game. In any case, it follows that females in an aversive state of hyper-arousal (e.g., stress or frustration) may be less likely than males to have their mood repaired from playing a violent video-game, due to the greater excitational similarity between the medium and the prevailing mood state.

Mood Management Theory, in summary, was not supported by the present findings. Females reported higher arousal following violent game play than did males, however overall post-play arousal did not differ significantly between the two game conditions as the theory predicted. Affect improved in the nonviolent game condition as predicted, but also increased in the violent game condition, which conflicts with the semantic affinity assumption. Similarly, frustration and stress decreased in both game conditions, rather than in the nonviolent game condition alone as the theory predicted. The only assumption of Mood Management Theory that received support was absorption

potential. Because both conditions experienced mood repair, it appears that the absorption potential of the games was high enough to adequately interrupt cognitive rehearsal and repair mood, regardless of semantic affinity. Altogether, MMT and its predictions were not supported by the data presented here, thus demonstrating the limited utility of this theory in understanding the effects of interactive media.

The second media effect theory, The Catharsis Hypothesis, was similarly unsupported by the present data. The Catharsis Hypothesis suggests that negative feelings can be purged through safe or vicarious expressions of aggression (e.g., watching a violent film, playing a violent game, hitting a punching bag). Consistent with the theory's predictions, frustration, stress, and hostility all decreased in the violent video-game condition. However, the same occurred in the nonviolent game condition, suggesting that it was not simply the "release" provided by the violent game that caused the reduction in hostility, stress, and frustration. The idea of Catharsis should not be completely discounted, however, because the violent game did lead to a *reduction* in these negative feelings rather than an increase. This observation is contrary to the findings of some other studies that did not use mood manipulation procedures (e.g., Anderson, 2004), but compatible with others that did use mood-inductions (e.g., Valdez & Ferguson 2012).

Excitation-Transfer Theory, the third media effect theory examined, found only correlational support. The theory predicts that an emotional reaction in a given situation can be intensified or altered by a prior, physiologically arousing event. Therefore, the prediction drawn from the theory was that the intensity of playing a first-person shooter

video-game would carry over to augment feelings of relief or even euphoria upon the elimination of a threat, or at the conclusion of a shooting match. This effect was expected to manifest as a positive correlation between post-play arousal and post-play affect, because past studies have reported the physiological excitement of violent and horror films as a potential explanation for increased enjoyment (Sparks, 1991). Excitation-Transfer Theory was supported by a positive correlation between arousal and affect post-play in the violent game condition, but not in the nonviolent game condition. This finding suggests that the excitement and intensity of first-person shooter video-games is correlated with heightened feelings of joy when a match concludes or when enemies are eliminated. The relationship between excitement and positive affect helps to explain the immense popularity of first-person shooters like *Call of Duty*. Although the excitement of first-person shooters may explain some of their appeal, the overall enjoyment of game play was not dependent on violent content, a result consistent with Przybylski, Ryan, and Rigby (2009), who argued that violent content in a video-game was not an important unique predictor of enjoyment.

User-Experience and Gender

Nine user-experience variables (focused attention, challenge, interactivity, telepresence, time distortion, enjoyment, performance, clear goals, and game controls) were investigated as potential important factors in understanding the psychological effects of video-games. Results of the study indicate these aspects are critical in predicting how video-games affect those that play them. All nine variables were significant individual predictors of post-Play affect, and performance and enjoyment

were the most uniquely important predictors. Perhaps more importantly, user-experience was a much more important predictor of psychological outcomes than were game content and gender.

Mahood (2009) and Klimmt et al. (2009) cited frustration with play and in-game performance, respectively, as important variables in predicting game enjoyment and post-play aggressive affect. In line with those findings, the results of this study strongly evidence the importance of performance in predicting post-play psychological outcomes. Self-reported performance in the video-game was the most important user-experience variable when it came to predicting post-play affect, with better performance correlating with more game enjoyment and more positive affect. Performance was also moderately positively correlated with focused attention and interactivity. Interactivity ratings were based on speed of interaction with the game, and were also highly positively correlated with ease of use when it came to game controls. Not surprisingly, it appears that participants who were able to quickly and effectively utilize the controls of the game were also able to perform better, thus leading to more positive psychological outcomes.

Overall enjoyment of video-game play was the second most important predictor of post-play affect. Evidently, those who enjoyed the game more reported higher levels of positive affect following game play. More interesting, however, was the relationship between game enjoyment and other user-experience variables. Enjoyment of game play was highly positively correlated with performance, focused attention, and interactivity, and was also significantly correlated with telepresence (or immersion), time distortion, and challenge. Further analyses revealed that with the exception of performance and

enjoyment, most of the user-experience variables were not predictive of post-play affect when considered alone but became strongly predictive as a group. While these findings lend support for the importance of variables like immersion (Ravaja et al., 2008), control (Klimmt et al., 2007), and competence (Przybylski et al., 2006), it is most likely that game enjoyment and a more positive mood state are both the result of the interplay between a number of different user-experience variables, especially those that directly pertain to the flow experience. It appears that video-games may indeed be uniquely suited to provide an experience of flow during game play, but only when a relatively optimal user-experience is achieved (Csikszentmihalyi, 1977).

In addition to the user-experience variables, gender was an important factor in psychological outcomes, most likely because of the relationship between gender and user-experience factors. More specifically, females in both game conditions felt more challenged and more immersed, but less confident using the game controls. Females also reported feeling worse about their performance in the game when compared to males. These differences in user-experience factors between males and females help to explain why females reported more stress and frustration after game play when compared to males. Frustration and stress are more likely to be maintained if a player does not feel confident using the controls and/or feels poorly about his or her performance.

Ample research has focused on the psychological effects of game content (specifically violence), without taking into account the subjective experience of the player, or the gender of the player (e.g., Anderson & Bushman, 2001; Anderson, 2004). Unlike television or film, video-games are highly interactive, so the element of

interaction must not be overlooked when investigating the effects of video-game play. Although other classic media theories like those examined here may serve as a good starting point for media research, they are unable to provide the full picture when it comes to assessing the effects of interactive media.

Strengths and Implications

The findings of this study have both practical and theoretical implications. Contrary to the popular contention that violent video-games lead to undesirable outcomes, the research presented here demonstrates that both violent and nonviolent video-game play can result in positive short-term psychological outcomes. After random assignment to groups following a mood-induction, those in the violent video-game condition experienced the same level of improvement in mood and reduction in hostile feelings as did the nonviolent game condition. However, males did report significantly more mood repair and slightly more positive affect after playing the video-games, suggesting that they found the experience more rewarding or enjoyable, in addition to feeling more competent. Certainly, previous research suggests that males find video-games more rewarding (Hoeft et al., 2008) and that they enjoy different features of game play than do females (Hartmann & Klimmt, 2006).

An important strength of this study is that the user-experience variables were rated equivalently in both game conditions. Participants did not report and notable differences in the difficulty of the two games or the intuitiveness of the controls. Previous studies comparing the effects of violent and nonviolent games have rarely included user-experience variables as possible sources of difference in psychological

outcomes. As the analyses presented in this thesis demonstrated, user-experience factors play a large part in understanding the psychological effects of video-games. Although some psychological changes that occur after game play may indeed be linked to violent content, other changes may be due to differences in the experience of the user (or player), and not the violent content *per se.* Additionally, because the games used in this study were popular and commercially available, the findings are more generalizable to the types of video-games that are popular today. The sample used in this study was also fairly representative of the current gamer population. Approximately 37% of gamers over the age of 18 are female (39% in sample) and persons ages 18-49 (18-35 used in sample) make up 53% of the gamer population (Entertainment Software Association, 2011).

Conclusion

Overall, the purpose of this thesis was to investigate the psychological effects of video-game play. Classic media effect theories were compared and contrasted in terms of their utility in assessing and predicting the effects of newer forms of media. This thesis also explored the importance of user-experience variables and gender in predicting psychological outcomes of play. MMT and The Catharsis Hypothesis were not supported by the results presented here, and Excitation-Transfer Theory was supported only by correlation. These findings suggest that traditional media effect theories, in their current state, are not sufficient for understanding the effects of newer forms of interactive media. Conjointly, the results highlight the importance of user-experience variables in understanding the psychological effects of video-games. For individuals who were

frustrated, playing a video-game led to an improvement in mood, whether the game was a violent first-person shooter or a self-paced problem solving game. Performing well in the game and having fun while playing were the most important variables in predicting post-play mood. A number of other variables pertaining to the flow state were also predictive of post-play mood, suggesting that the experience of competence (i.e., good performance and intuitive controls), flow, and enjoyment during game play may be responsible for the temporary improvements in psychological well-being. When attempting to deal with stress or frustration, video-games may be effective stress-relief tools as long as the player is able to feel competent, focused, and enjoyably immersed in play.

Moreover, this study revealed a number of important gender differences. For example, females reported more frustration and stress after game play in both game conditions, and reported much higher levels of physiological arousal than males reported in the violent game condition. These gender differences suggest that males and females do not react the same way to video-game play or video-game content, and that males and females have different subjective experiences playing the same games. Namely, females tend to feel less competent when it comes to using game controls and performing well in the game, which may reduce benefits drawn from play.

In summary, some of the psychological effects of video-games are dependent on the interaction between the player and the game during a play session. Following a negative or stressful experience, a positive experience in a video-game session might repair stress, heighten mood, and increase feelings of control or dominance. Conversely, a negative experience in a video-game might actually increase feelings of stress and

frustration, or at the very least fail to repair the bad mood. Further, males tend to enjoy video-games more, feel more confident using the controls, and derive more psychological benefits from play (at least in the short-term). Although gender was not a significant predictor of post-play affect, males and females did vary in their feelings about playing the game, and they responded differently to the two game types. It follows that gender and user-experience variables should always be considered when assessing the psychological effects of video-game play.

Limitations and Future Directions

Although this study utilized an experimental design and used random assignment to groups, limited resources did not allow for a control condition. Therefore, there was no condition in which no video-game was played. Such a condition would allow us to determine which of the observed psychological changes occurred as a result of game play and which occurred simply due to the passage of time. However, the large and significant correlations found between all user-experience variables measured and affect after game play strongly suggest that much of the psychological changes observed were due to various aspects of interactive engagement. Furthermore, Mulligan (2008) used a similar method and found that participants who played a video-game experienced significant improvements in mood, but that there was no significant improvement in mood observed in a no-game condition. The relationship between post-play positive affect and user-experience variables, however, was only correlational in nature, and not necessarily causal. In order to better pin down this cause and effect relationship, future research should experimentally manipulate different user-experience variables (e.g.,

dramatically alter difficulty level or slow the speed of interaction) and observe how psychological outcomes differ as a result.

Another limitation of this study is that it was conducted using small laboratories. Although the set-ups used in the labs were intended to mimic home game play as much as possible, the spaces were still extremely small and lacked temperature control. Additionally, the two main researchers who interacted with the participants in this study were female and similar in age to the participants themselves. Having two female researchers may have caused differences in reactivity between males and females. Therefore, these environmental variables (room size and the gender of the researcher) were both potential threats to internal validity.

All of the participants in this study were California State University students, and most were majoring in psychology. The majority of the sample (74%) was either Asian/Pacific Islander or White/Caucasian, with individuals of other ethnicities comprising only 27% of the sample. Furthermore, only students who played some form of video-game at least one hour per week on average were permitted to participate in the study. These are all important limitations in the generalizability of the results. Therefore, the findings presented here may not be applicable to non-college students, students of other ethnicities, or individuals who do not usually play any video-games. There were also two unexpected problems regarding the questionnaire items used. The words “aroused” and “engrossed” were both misinterpreted by participants. Because the misunderstandings led to invalid responses, these two items had to be removed from the analyses.

Future research should address these potential threats to internal, external, and construct validity. First, future studies should include a control condition in order to determine which changes in the psychological state of the individual are due to the passage of time, and which are due to video-game play. If possible, future studies should also experimentally manipulate various user-experience variables to better demonstrate the cause and effect relationship between user-experience and psychological outcomes. Second, researchers should use temperature-controlled rooms to prevent large fluctuations in temperature over time that could influence mood, and attempt to use both male and female researchers to limit gender differences in reactivity. Third, a more ethnically and educationally diverse sample should be utilized, to increase the generalizability of the results. Fourth, researchers should use survey items that use only laypersons' terms in order to ensure that anyone in the general adult population can understand the meanings of the questions they are being asked.

In sum, although the content of a game may be a factor in the psychology of its effects, future research should focus on the aspects of player experience that make video-game play psychologically beneficial, and not just those that lead to negative outcomes such as stress, frustration, or hostility. Researchers should consider both gender and user-experience variables (particularly performance, enjoyment, and flow) by examining male and female responses separately, and by measuring user-experience variables during or after game play. Taking these important variables into consideration would help rule out alternative explanations for the effects observed. Understanding the interaction between

a player and a video-game will lead to a much better understanding of the psychological changes that occur, and the mechanisms behind those changes.

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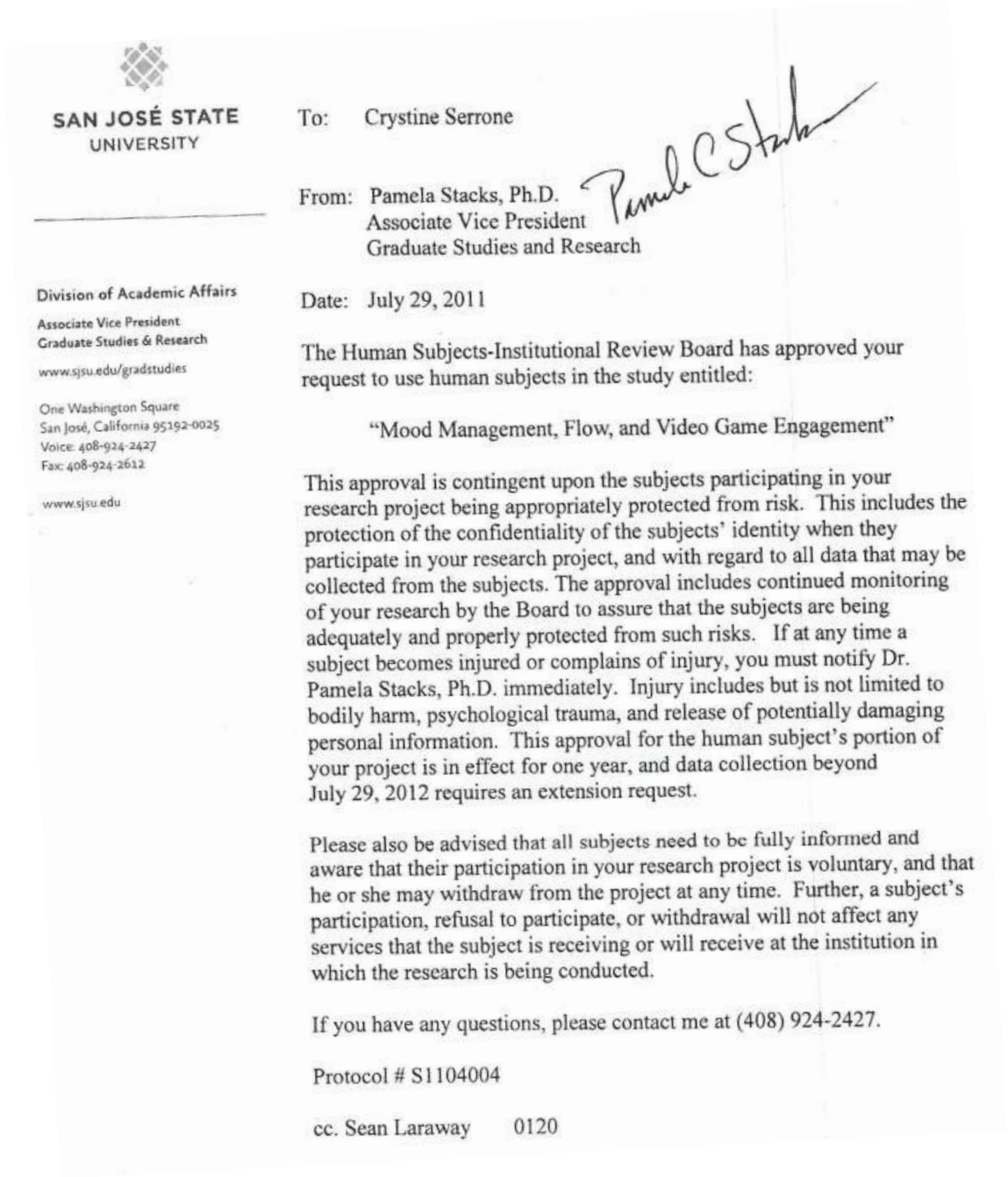
Appendix A

IRB Approval Letter



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To: Crystine Serrone

From: Pamela Stacks, Ph.D.
Associate Vice President
Graduate Studies and Research

Date: July 29, 2011

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

"Mood Management, Flow, and Video Game Engagement"

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the confidentiality of the subjects' identity when they participate in your research project, and with regard to all data that may be collected from the subjects. The approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Dr. Pamela Stacks, Ph.D. immediately. Injury includes but is not limited to bodily harm, psychological trauma, and release of potentially damaging personal information. This approval for the human subject's portion of your project is in effect for one year, and data collection beyond July 29, 2012 requires an extension request.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services that the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2427.

Protocol # S1104004

cc. Sean Laraway 0120

Appendix B

Consent Form

Agreement to Participate in Research

Responsible Investigator: Crystine Serrone (SJSU Student), & Sean Laraway, Ph.D.
Title: Video-Games and User-Experience

1. You have been asked to participate in a research study investigating video-games and user-experience.

2. You may be asked to engage in various tasks, including playing video-games or solving puzzles. You will also be asked to answer questions about your mood state and to report demographic information (e.g., age, gender, and previous video-game experience), as well as your experience in playing the video-game in this study. These tasks should take approximately 1 hour to complete.

3. You may be asked to play a first-person shooter video-game that includes scenes of graphic violence (including shootings), which some may find disturbing. This game is rated "M" for Mature due to its graphic violence. In playing this game, you will try to kill enemy soldiers and avoid being killed. Risks from playing this video-game may include emotional distress (fear, anxiousness) and physiological arousal (increased heart rate). If you are disturbed by video-game violence, you have the right to not play the violent video-game if you do not wish to do so. You also have the right to stop playing at any time. Please inform the researcher now if you do not wish to play the violent video-game. Additionally, the games in this study use a first-person perspective, which may cause minor dizziness or motion sickness for some individuals. If you experience any motion sickness or dizziness, you may choose to stop playing the game or look away from the screen for a few seconds. Inform the researcher if you wish to stop playing the game.

4. This study does not provide any direct benefits, however those interested in video-games may benefit from experience with a new, commercially available video-game.

5. Although the results of this study may be published, no information that could identify you will be included. You will be given a unique identification number to ensure confidentiality.

6. If you have arranged to receive extra credit or partial course credit for participation in this study, it will be given to you upon completion of the study procedures. If you are not able to receive any credit for participating, then you will be entered into a raffle to win one of two prizes.

7. Questions about this research may be addressed to Crystine Serrone or Sean Laraway, Ph. D. Complaints about the research may be presented to Ronald Rogers, Ph.D., Department Chair, Psychology Department, at (408) 924-5652. Questions about a research subject's rights or research-related injury may be presented to Pamela Stacks, Ph.D., Associate Vice President, Graduate Studies and Research, at (408) 924-2427.

8. No service of any kind, to which you are otherwise entitled, will be lost or jeopardized if you choose to not participate in this study.

9. Your consent is being given voluntarily. You may refuse to participate in the entire study or in any part of the study. You have the right to not answer questions you do not want to answer. If you decide to participate in the study, you are free to withdraw at any time without any negative effect on your relations with San Jose State University.

10. By agreeing to participate in the study, it is implied that you have read and understand the above information.

Appendix C

Debriefing Form

Debriefing Form

Title of study:
Video-Games and User-Experience

Summary of study:
In this study, you were given a set of logic problems to solve in a 10-minute period. In the experimental condition you were randomly assigned to, the logic problems were extremely difficult, and designed to exceed the capabilities of college students. Your performance on the logic problems is in no way related to your problem solving abilities or intelligence level.

You were told that the problems were typical intelligence test questions in order to frustrate you. The true purpose of this study is not only to investigate user-experience, but also to investigate the emotional impact of various games and the potential for video-games to be used as mood management tools.

Please do not discuss the true nature of this study with anyone else at this university.

Whom to contact for more information:
If you have questions about this study, or if you would like to receive a summary report of this research when it is completed, please contact Sean Laraway and Crystine Serrone.

Whom to contact about your rights in this experiment:
Pamela Stacks, Ph.D., Associate Vice President, Graduate Studies and Research, at (408) 924-2427.

Thank you again for your participation!

Crystine Serrone
Sean Laraway, Ph.D

Appendix D

Demographic and Video-Game Experience Questions

In just a couple sentences, please explain why you did or did not like playing the video-game (Free response).

Have you played a Call of Duty game before (not included today)?

(1) I have played it a lot

(2) I have played it a little

(3) I have never played it

Have you played either Portal or Portal 2 before (not including today)?

(1) I have played it a lot

(2) I have played it a little

(3) I have never played it

For about how many years have you played video-games?
(Free response)

Which type of video-game do you play most often?

(1) Action-Adventure (e.g., Uncharted, God of War)

(2) Shooter (e.g., Call of Duty, Unreal Tournament)

(3) Role-Playing (e.g., The Elder Scrolls, Final Fantasy)

(4) Simulation (e.g., The Sims, Rock Band)

(5) Strategy (e.g., Civilization, Warhammer)

(6) Sports (e.g., Madden, FIFA)

(7) Serious/Educational (e.g., Wii Fit, Brain Age)

(8) Casual (e.g., Angry Birds)

(9) Other (please specify)

On average, how many hours per week do you spend playing first-person shooter games? If you don't play any shooter games, enter "0".
(Free response)

On average, how many hours per week do you spend playing video-games that have violent content (involve blood, graphic violence, etc.)? If you don't play any violent games, enter "0".
(Free response)

On average, how many hours per week do you spend playing nonviolent video-games? If you don't play any nonviolent video-games, enter "0".
(Free response)

If there is anything else you would like to tell us about your game play experience today or how you feel about video-games in general, you may use the text box below.
(Free response)

Demographics

What year were you born?
(Free response)

Please indicate your gender.

(1) Male
(2) Female

Please indicate your ethnicity.

(1) White/Caucasian

(2) Black/African American

(3) Hispanic/Latino

(4) Asian/Pacific Islander

(5) Native American

(6) Other (please specify)

_____