

## Examining the relationship between violent video games, presence, and aggression.

Kristine L. Nowak, Marina Krcmar, Kirstie M. Farrar  
University of Connecticut

{kristine.nowak, marina.krcmar, kirstie.farrar}@uconn.edu

### Abstract

*The level of presence, or immersion, a person feels with media influences the effect media has on them. This project examines both the causes and consequences of presence in the context of violent video game play. In a between subjects design, 227 participants were randomly assigned to play either a violent or a non violent video game. Causal modeling techniques revealed two separate paths to presence. First, individual differences predicted levels of presence: men felt more presence while playing the video game, as did those who play video games more frequently. Secondly, those who perceived the game to be more violent felt more presence. Those who felt more presence, felt more resentment, were more verbally aggressive, and that led to increased physically aggressive intentions.*

*Keywords--- Presence as immersion, video games, aggressive affect, violence, aggression, and social learning theory.*

### 1. Introduction

The sense of presence, or the sense of involvement with and engagement in media, influences how people respond to mediated stimuli, and how it affects them [1-3]. As with social learning from media and media effects generally, the sense of presence varies across contexts, content, and media, as well as from person to person and from one exposure to the next. Both the level of presence with the media [4-6] and aggressive responses to mediated stimuli [7, 8] have been shown to be influenced by individual differences (e.g., gender, media use), and features of the medium (e.g., screen size, interactivity, vividness, agency). Therefore, understanding the factors that influence the sense of presence and its potential influence on aggression may provide insight into the process of media effects and when and why some people respond differently to the same mediated stimuli, whether violent or not, than others.

Being able to predict when, and to what extent, media will influence people is of critical importance particularly when considering media violence. In this study, we examine how individual difference variables (e.g., gender, video game use) influence people's

responses to an experimental manipulation (i.e. violent game play) in terms of their sense of presence and subsequent

level of aggression.

After 4 decades of research, scholars have concluded that exposure to media depictions of violence can cause aggressive behavior including the imitation of violent acts [9-11]. There is also evidence of desensitization, with those who see more violence having a greater acceptance of, and tolerance for, violent behavior [12, 13]. As Anderson [14] argued, the "scientific debate over whether media violence has an effect is over" (p.114). Research using experimental, longitudinal and cross sectional methods has concluded that exposure to violent television, film, and video games causes increased aggressive behaviors and attitudes and decreased prosocial behaviors among adults, children, men and women [14, 15]. In most, although not all cases, researchers have found stronger effects following exposure to video game violence as compared to exposure to television violence [16].

More importantly, this effect seems to be getting stronger. Gentle, et al [15] argued that video game research that is 10-15 years old likely underestimates the effect of current video games on players. Video games have become more realistic, engaging, and increasingly violent. They use more vivid and sophisticated graphics, including vividly depicted violence against human characters. They are also more engaging--requiring active participation in games made possible by interactivity and increasingly involving input devices such as head mounted displays and data gloves. These changes to video games have led to increased concern over the effects of exposure to, and interaction with, violence video games. In addition, research has shown that these more current, technologically advanced violent games have led to increased levels of aggression from video game players when compared to the much tamer games of a decade or more ago [17].

Despite what is known about the effects of violent television, and to a lesser extent, the effects of violent video games, there are still unanswered questions regarding how different kinds of people respond to games and how those responses might influence people's perceptions of acceptable behavior, or social learning, and how this might in turn affect outcomes. Exploring the processes that predict when, how, and to what extent, exposure to violent video games will influence both people's perceptions of acceptable behavior, their sense of presence, and their overall levels of aggression is of critical importance not only for researchers, but also for policy makers and society in general [18].

This article reports the results of an experiment that

examines both the causes and consequences of presence following people's exposure to violent video games, their perception of the violence and how presence is related to aggressive affect. We first measure individual difference variables (gender, previous video game use), then manipulate the presence or absence of violence experienced while playing video games. Finally, we use causal modeling techniques to show the extent to which variations in degree of presence causes variations in levels of aggression. We specifically examine whether a person's level of presence can predict levels of aggressive outcomes including resentment, hostility, and verbal aggression and physically aggressive intentions.

## **2. Learning and modeling from the media: Social Cognitive Theory**

Social cognitive theory (SCT) [19] grew out of Bandura's earliest work on social learning theory [20]. Whereas social learning theory proposed that learning can occur through modeling and imitation, more recent theoretical work on social cognitive theory [21] "accords a central role to cognitive, vicarious, self-regulatory and self-reflective processes....Most external influences affect behavior through cognitive processes rather than directly. Cognitive factors partly determine which environmental events will be observed, what meaning will be conferred on them, whether they leave a lasting effect, what emotional impact and motivating power they will have, and how the information they convey will be organized for future use," (p. 122). In other words, learning can occur through imitation of direct and mediated modeled behavior [10]; however, the cognitive experience of the observer has an effect on any outcomes that will result.

In the case of video game violence, various aspects of the theory are more specifically relevant. For example, early social learning theory argued that behaviors that were rewarded were more likely to be imitated by an observer than behaviors that were punished or went unrewarded [22]. More recent advances in the theory would argue that it is the cognitive interpretation and experience of that witnessed event that would lead people to act in ways that create desirable outcomes, avoid negative outcomes, and utilize information about the consequences of others' actions in making their decisions about how to act, and what behaviors to imitate [23]. Therefore, both the rewarded event being witnessed, and the cognitive experience of that event by the observer might impact likelihood of imitation.

In support of SCT, early research on television violence has found that when media depict a character being rewarded, or even not punished, for aggressive behaviors, viewers are more likely to imitate the behaviors [24]. This is particularly relevant in the case of video games, where aggressive behaviors are often required, and players are rewarded for aggressive behavior. The interactive nature of video games means that these aggressive actions influence

the outcome of the game, as well as what the player sees. By acting aggressively, players earn points, move up to the next level and may ultimately win the game. By rewarding the aggressive and violent actions of video game players, it may promote the perception that violence is useful, appropriate and even a good way of dealing with conflict [18]. Furthermore, the interactivity of video games requires players to engage in the game to attain the skills required to read the output devices and to quickly react and manipulate the input devices provided with the interface [25]. In accord with social cognitive theory, this level of interactivity and engagement is the cognitive experience of the game that may explain why exposure to video game violence results in higher levels of aggression than exposure to television violence [16].

Essentially, both social cognitive theory, and the extant literature on mediated violence, suggests that observing rewarded behavior makes that behavior seem more attractive and more likely to be imitated. The interactive nature of video games requires active participation and a higher level of presence, or involvement [6]. This active participation and increased presence may make it even more likely that people will imitate and repeat the behaviors they learned and practiced when playing the game. In the case of violent video games, this could increase aggression.

## **3. Hostility**

The majority of research to date has examined the effect of media violence on verbal and physical aggression. However, outcomes such as aggressive affect or hostility have also been explored. For example, violent video game play can influence aggressive cognitions or thoughts and has been found to increase hostility [6, 26, 27]. Meta-analyses conducted on the research on violent video games have also supported an effect of game play on levels of aggressive cognitions and hostility [16, 17]. Therefore, aggressive cognitions and hostility are affected by exposure to media violence.

Furthermore, affective hostility mediates the relationship between exposure to violent video games and aggressiveness [15]. Therefore, it is important to include measures of hostility in a complete model that explores the relationship between video game play, aggression, and, as we explore here, presence.

## **4. Presence and the Suspension of Disbelief**

The sense of presence may be thought of as the level of involvement with the medium. Although the concept of presence is multidimensional, we use the term here as associated with immersion, or a sense of being 'in' the medium. This dimension of presence is also sometimes called telepresence [1-3, 28]. The International Society for Presence Research [29] defines presence, which it calls a shortened version of the term 'telepresence,' as "a

psychological state or subjective perception in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience." If, as some researchers have argued [2], presence can only occur when it is brought about by technology, than 'tele' as in telepresence becomes unnecessary [30]. Therefore, we use the term presence.

To experience true presence then, one must suspend awareness that the source of stimuli is mediated, which is often called a willing suspension of disbelief. This suspension of disbelief can be conscious or not. This implies that a person is engaging their senses (hearing, sight) to receive the stimuli coming from a mediated environment, (Virtual reality, television, radio, video game, etc). This focus on the mediated stimuli comes at the expense of information, or stimuli, coming from natural, or unmediated sources (honking cars, people in the room, etc).

Although presence is traditionally associated with research in virtual reality [3, 31]), a theory of presence is applicable to all media [1-3]. For example, even television related variables such as screen size [2, 4, 5] and a number of other factors including level of interactivity, and avatar anthropomorphism [1, 32, 33] have been shown to influence people's sense of presence.

Presence or a sense of being "in" the mediated environment is also likely to increase when one is familiar with the medium. In the case of video games, it is clear that presence is enhanced once the initial frustration of learning the game is passed and a player can fully engage in the challenge of the game itself [6]. Therefore, increased play will likely lead to decreased frustration which in turn will lead to increased presence. Finally, some individuals are more prone to feeling present with media than others [1]. For example, interest in the message or environment has been shown to increase a sense of presence and people's willing suspension of disbelief [34]. Also, males and females have been shown to experience presence differently [35]. Therefore, these variables are examined in the present study.

## 5. Considering the relationship between presence and social learning.

Just as individuals differ in their hostile or aggressive reactions to media, there are individual differences in players' feelings of presence. The two factors known to be related to individual differences in presence are gender, and experience with the medium, though these two factors are highly correlated.

On average, boys play video games for greater duration and with greater frequency than their female counterparts [36]. This increased frequency represents a fairly large investment of time in the game, which should increase skill with the game over time. As with any learned activity, practice improves skill, which increases enjoyment, and acts

as its own reinforcement.

Perhaps in part due to this greater experience and enjoyment, men play more games and also experience a greater sense of presence following exposure to violent games. Wilfred's [37] examination of the effectiveness of VR based simulation training revealed that males felt more presence than women following a game based interaction in a virtual environment, although he did not control for previous experience with VR technology.

Previous research has shown that in addition to playing games less frequently, and feeling less presence, women tended to perceive depictions of violence as more severe than men who watched the same depictions [38]. Further, men were more aggressive after playing a violent video game than women [39], though men are more aggressive than women, in general [40]. Overall, then, it would seem that men are more likely than women to enjoy the game, and to experience a greater sense of presence when playing a violent game, as well as afterwards. Social cognitive theory would argue that the cognitive experience of the game by the user would influence any emotional and behavioral outcomes of game play. For example, because males play more often and have more experience in game play, not only is play less frustrating, but their greater experience allows them an opportunity for greater immersion or presence in the game.

However, gaming experience and presence are not the only predictors of, or explanations for, the level of a person's aggressive responses. Players' interpretations of violent stimuli may be equally important. For example, individual interpretations of violent stimulus have been found to affect aggressive outcomes [41] and men are likely to perceive the depicted violence as less severe than women [38]. In addition, because game play is largely a cognitive experience where players' experiences occur between the screen and the mind, it is important to explore how the cognitive experience of this event affects outcomes. Here, social cognitive theory would argue that *perceptions* of violence and *perceptions* of presence in the game are likely to result in greater hostility and greater aggression.

It is possible the perception that those who perceive violence as less severe are more likely to accept, adapt, or just believe that behaviors that others would classify as aggressive were more normative. If this is true, then social learning would predict that they would behave more aggressively after exposure to violence.

Essentially, as discussed above, various factors are likely to affect game play outcomes. Gender is likely to affect frequency of game play in general, but also to affect feelings of presence during game play. In part due to this greater frequency of game play, males are also less likely to feel frustration during play.

Here we examine the extent to which presence may moderate the relationship between perceptions of violence and aggressive affect. If we extend the predictions of SCT to this context, then we could predict that combining the

vicarious experience of playing games with the cognitive perception that the game is violent would result in a more intense and involving, game experience, or increased presence. Therefore, we predict that participants' perception that the video game is violent will lead to increased presence, and that the sense of presence will increase aggression. That is, we predict that presence, and the *experience* of game play cause differences in aggression.

Overall, there has been little empirical testing of the effect of increased presence on learning or outcome variables, such as aggression. As Wilfred, [37] pointed out, "There is much more focus on the technology of virtual reality than there is evaluation of its impact on learning. The efficacy of the VR systems developed, and what factors mediate this effectiveness are seldom studied." The same is true of presence research, with a few exceptions. In this project, we examine some of the predictions outlined above with a causal model of the relationship between gender, game use, presence and aggression to shed further light on the relationship between these variables.

## 6. Methodology

This study uses an experimental design and causal modeling techniques to examine the causes and consequences of presence in the context of violent video games. Participants were randomly assigned to play either a violent or non-violent game before responding to a number of questionnaire items.

### 6.1. Participants

Participants in this study were 227 undergraduate students (109 males, 117 females, one subject did not report gender) enrolled in lower division Communication courses at a large East Coast University. Participants received extra credit for taking part in this research.

### 6.2. Stimulus Materials

For the purposes of this research, violence is defined using the operational definition from the National Television Violence Study (NTVS): "any overt depiction of a credible threat of physical force or the actual use of such force intended to physically harm an animate being or group of beings" [42], p. 30). So, in order to qualify as a violent game for this research, the main character in the game had to demonstrate actual intent to physically harm others. The violent game used for this study is Hitman II, Silent Assassin. This game received an Entertainment Software Rating Board (ESRB) rating of "M" for Mature. The nonviolent control game is Tony Hawk, Pro Skater3. Tony Hawk received an ESRB rating of "T" for teen.

### 6.3. Measurement Instruments

All scales were tested for internal consistency and parallelism through confirmatory factor analysis using the software CFA (Hamilton & Hunter, 1997).

**Demographic variables.** Subjects indicated their gender, age, year in school and race.

**Game Use** was measured with a 5 item likert-type scale on a 7 point metric (Standardized Alpha = .84). Participants were asked to indicate how frequently they play different types of video games.

**Perceived Violence** was measured with a 3 item likert type scale with a 7 point metric (Standardized Alpha = .85). Participants were asked to think about the game they played and rate it in terms of violent content.

**Frustration** with the game was measured with a 2 item scale (easy/difficult, or frustrating/not frustrating) with a 7 point metric (Standardized Alpha = .77).

**Presence** as immersion, or the extent to which participants felt that they were "inside" the video game [43, 44], was measured with a 5 item likert type scale with a 7 point metric (Standardized Alpha = .89).

**Hostility** was measured using 8 items [45]. These were likert type items on a 4 point metric (Standardized alpha = .92).

**Aggression.** Finally, aggressiveness was measured by using a modified version of the Buss-Perry version of the aggression questionnaire [46]. The items in this study were slightly reworded to reflect state rather than trait aggression. Before responding to these items, participants were asked to: "Imagine that you leave this building when you're done completing this survey. Someone bumps into you, spilling your drink and the contents of your backpack." They were then asked to rate whether each potential reaction was "0" (extremely uncharacteristic of me) to "6" (extremely characteristic of me). This reworded version of the Buss Perry aggression scale has been found to be reliable, and to more accurately tap participants' responses to an aggressive prime [47]. Confirmatory factor analysis tests revealed three separate dimensions on this scale, including resentment, verbal aggression and physically aggressive intentions. Items and the construct they measured are detailed below.

**Resentment** was measured with 5 aggression items (Standardized alpha = .88). These items included 'this person always seems to get the breaks,' 'I think this person talks about me behind my back,' 'I would be suspicious of this person being overly friendly.'

**Verbal Aggression** was measured with 5 aggression items (standard alpha = .89). They included 'I would tell this person openly that I disagree with him or her,' and 'this person would say that I'm somewhat argumentative.'

**Physically Aggressive Intentions** was measured with 5 aggression items (standard alpha = .88). They included 'given enough provocation, I would hit this person,' and 'if this person hit me, I would hit back.'

## 6.4. Procedure

Male and female undergraduates were randomly assigned to play either the nonviolent control game or the violent game for 12 minutes. All games were played on a Sony PlayStation II gaming console hooked up to a 13-inch color television monitor. Participants filled out a post-test immediately after playing.

## 7.0. Results

To test the relationship between these variables, a causal modeling technique was employed using Path Version 5.0. The model shown in Figure 1 contains only significant structural coefficients at  $p < .01$ , with no significant missing paths indicating that all variables with direct relationships have paths in this model. The overall goodness-of-fit of this model, as measured by the Root Mean Square Error of Approximation (RMSEA), is .05, matching the desirable value of .05 or less and far from the unacceptable value of .10 or greater. The overall model chi-square is 11.83 with 24 d.f., which does not differ significantly from the original data,  $p = .98$ . This is well above the desirable significance level of .05 or greater. Finally, no reproduced errors were above .10. On balance, the structure of the final model appears to be a good fit with the observed data. This section will first discuss the separate paths to presence and then discuss the impact of presence on aggression.

This model shows two separate paths to presence: one through individual differences (biological sex and previous game use), and the other through condition (violent game or non-violent game). Both of these variables have paths directly to presence and also to level of frustration. There is a large path showing that perceived violence increases presence, but also a moderate negative path from game type to presence, indicating that those who played a violent game felt less presence. Perceived violence increased frustration, and men felt less frustration than women. Those who were more frustrated felt less presence. The model also shows that presence increases hostility and aggressive affect.

The first path to presence is from individual differences including gender, and previous game use, both of which also predicted the level of frustration. Also, biological sex is a very strong predictor of previous game use. Males play significantly more video games than females, and those who play more games felt more present. However, there was no link from gender to perceived violence and no difference between men and women in terms of how violent they perceived the game, though men felt less presence than women overall.

However, two somewhat contradictory factors are influencing presence. First, the direct path from biological sex to presence shows that, all things being equal, females felt more presence than males. However, females, and people who do not use video games a lot, felt the game was

more frustrating, and frustration reduced presence. The path showing that frustration decreased presence was larger than the path from biological sex to presence, revealing that frustration (and game use) has a stronger effect on presence than biological sex, though again, both of these factors are predicted by biological sex.

There was also a direct path from biological sex to both verbal and physically aggressive intentions, with males demonstrating more verbal and physically aggressive intentions than women. This was true regardless of previous game use, level of frustration, or which game they played (violent or nonviolent). People who frequently played video games may have been more aggressive from the beginning, but there is not a direct path from game use to aggression; only from game use to frustration and presence.

The second path to presence comes from both condition (violent or nonviolent game) and the level of perceived violence, and there appears to be contradictory influences on presence from this direction as well. Those randomly assigned to play a violent game perceived that game to be more violent than those assigned to the control game. This perception of violence strongly increased presence, with moderate to small influences on resentment, and frustration with the game, though it decreased people's hostility, regardless of gender or previous game experience. However, there is a direct path from condition to presence, which indicates that those who played a violent game felt less presence when condition was not moderated by perceived violence.

Those who play more games in general were less frustrated and felt more presence, and this in turn resulted in greater verbal and physically aggressive intentions and hostility. Thus, previous game use did not predict verbal aggression directly; however, the relationship between these variables is mediated by presence.

There were only two direct links from presence: hostility and verbal aggression. Presence directly predicts hostility, which predicts resentment, which predicts verbal aggression and physically aggressive intentions. Also, presence directly increases verbal aggression, which increases physical aggression. There were direct links to physical aggression from violent game, biological sex, and verbal aggression.

exposure to games. In this case, the different reactions to media stimuli would depend upon interest in, or comfort with, the content. However, we note that the difference in level of frustration held was predicted by the perception of violence and not by whether participants played a violent or non-violent game.

It is important to recognize that the previous game use measure in this study did not specifically measure violent video game usage. This may explain why there is not a separate path directly from game usage to aggression. Future research should measure violent video game play separately to test whether those who play more violent video games are more aggressive than those who play other video games following a short exposure to violent stimuli. This would allow for the distinction between familiarity with the medium, and aggressive priming, as the cause of increased presence and aggression.

Also, this limited test of video games and aggression seems to suggest that both overall game use and the experimental manipulation of game play have an influence on the aggression measures. However, as with the research by Gentile, et al [15], in this study there was no direct link between game use and hostility. Instead, presence mediated the relationship between game use, and hostility and aggressive outcome variables. In addition, frustration mediated the relationship between games use and aggression, suggesting that both the cognitive experience of presence and the affective experience of frustration and presence are the processes by which aggression is increased.

In the case of the game manipulation, there was a direct impact on presence, with those playing a violent game feeling less presence. However, the very strong effect of perceived violence on presence reveals that those who perceived the game as more violent felt a greater sense of presence, and they felt more resentment directly associated with play. However, those that perceived more violence felt less hostility. In line with our earlier argument, those socialized to perceive violence might also become more immersed in a violent story line.

Finally, presence, both that associated with game use and that associated with the experimental manipulation, resulted in greater verbal aggression and more physically aggressive intentions. These findings are consistent with social cognitive theory [21] in that the symbolic experience of game play, in part as indicated by presence, affects outcomes. Note that there are no direct paths from game use, or the experimental manipulation, to verbal or physical aggression (though there are small paths from perceived violence to resentment and hostility). As Bandura would argue: "An extraordinary capacity for symbolization provides humans with a powerful tool for comprehending their environment and creating and regulating environmental events that touch virtually every aspect of their lives ([21], p. 122)."

Despite support for social cognitive theory, there are some anomalous findings in the model. Specifically, those

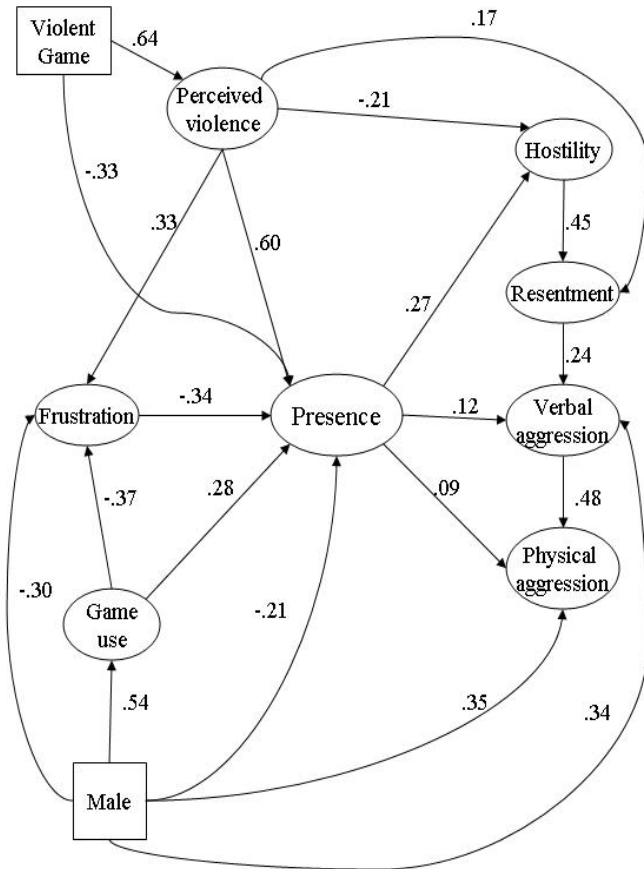


Figure 16 Path Model

This sense of presence and reduced frustration among males seems to occur both because of more frequent game use and independent of it. In the former case, it is reasonable that experience allows one to experience more presence with the medium, become more involved in the story line and less frustrated by the experience of game play. People who were not frequent game players may have had to allocate more cognitive resources to figuring out the rules of the game, or to learning how to work the interface. This may well have increased frustration, and consistently reminded the participant that the experience was mediated, which would reduce presence. In the latter case, it may be that males, socialized to enjoy more aggressive story lines, can become more involved even without the benefit of previous

who perceived greater violence in the game experienced less hostility. Perhaps when players perceived the game as violent, but did not experience greater presence, they did not engage as much with the content and played the game as a way to pass time. So, it is not that exposure to violence reduced hostility but that without presence, hostility was not increased as much. Essentially, the lower level of presence may have resulted in lower levels of affective hostility. This argument is supported in part because when presence did not mediate the link between game play and hostility, the path was negative. In other words, aggression results from true involvement in the violent game (i.e., presence) and not from game play as a means to pass time. This argument is consistent with a uses and gratifications approach to media [48] that argues that the way media are used influences resulting outcomes.

Understanding the causes and consequences of presence may be central to our understanding of who will be most affected by media violence and under what conditions. Since we know that increased presence increases aggressive affect, we can look to things that increase presence (both individual differences and features of the media) for cues about how to predict the influence of violent media on people.

The results from this study, as well as previous studies, show significant effects on hostility and aggression as a result of playing a game for very small amounts of time—particularly when they are present, or engaged. Men and women did not differ in terms of how violent they perceived the game, and those who played the violent game were more aggressive than those who played the control game. This raises the question of the effects on adolescents of playing hours of video games per week, especially given that more frequent use of video games can raise increase both presence and aggressive affect in short exposures. It suggests that the over time use of video games may prime users to quickly experience aggressive affect and perhaps engage in aggressive behaviors when they encounter violence or unpleasant stimuli, whether mediated or not. This is particularly true when presence is increased. Also, as Anderson [14] suggested, there is a need for more longitudinal studies, as well as a need to educate the public about the potential effects of exposure to violent media and particularly the effects of playing violent video games. As suggested by Sherry's [17] meta-analysis, the effect of video games on people's aggression is likely to continue to increase. Video games are becoming more vivid, are being presented on larger screens, including surround sound, engaging characters, and compelling storylines, all of which have been shown to increase presence, which these data show increases aggression.

## Acknowledgements

We would like to thank Mark Hamilton for his assistance with this project.

## References

- [1] T. Kim and F. Biocca, "Telepresence via Television: Two dimensions of Telepresence may have different connections to memory and persuasion," *Journal of Computer Mediated Communication*, vol. 3, pp. Retrieved from <http://www.ascusc.org/jcmc/vol3/issue2/kim.html>, 1997.
- [2] M. Lombard and T. Ditton, "At the heart of it all: The concept of presence," *Journal of Computer-Mediated Communication*, vol. 3, pp. Retrieved March 10, 2006, from (<http://www.ascusc.org/jcmc/vol3/issue2/>), 1997.
- [3] J. Steuer, "Defining virtual reality: Dimensions determining telepresence," *Journal of Communication*, vol. 42, pp. 73-93, 1992.
- [4] M. Lombard, "Direct responses to people on the screen: Television and personal space," *Communication Research*, vol. 22, pp. 288-324, 1995.
- [5] B. Reeves, B. Detenber, and J. Steuer, "New televisions: The effects of big pictures and big sound on viewer responses to the screen," presented at Information Systems Division of the International Communication Association, Washington, D.C., 1993, May.
- [6] R. Tamborini, M. Eastin, K. Lachlan, P. Skalski, T. Fediuk, and R. Brady, "Violent virtual video games and hostile thoughts," *Journal of Broadcasting and electronic Media*, vol. 48, pp. 338-154, 2004.
- [7] B. J. Bushman, "Moderating role of trait aggressiveness in the effects of violent media on aggression," *Journal of Personality and Social Psychology*, vol. 69, pp. 950-960, 1995.
- [8] B. J. Bushman, "Individual differences in the extent and development in aggressive cognitive associative networks," *Personality and social psychology bulletin*, vol. 22, pp. 811-819, 1996.
- [9] E. Donnerstein, Slaby, R., & Eron, L., "The mass media and youth violence," in *Violence and youth: Psychology's response*, vol. 2, E. R. J. Murray, & G. Comstock, Ed. Washington, DC: American Psychological Association, 1994, pp. 219-250.
- [10] H. Paik and G. Comstock, "The effects of television violence on anti-social behavior: A meta-analysis," *Communication Research*, vol. 21, pp. 516-546, 1994.
- [11] B. Wilson, D. Kunkel, D.Linz, W. J. Potter, E. Donnerstein, and S. Smith, "Violence in television programming overall: University of California Santa Barbara study," in *National Television Violence Study*, vol. 1. Thousand Oaks, CA: Sage, 1997.
- [12] [M. H. Thomas, R. W. Horton, E. C. Lippencott, and R. S. Drabman, "Desensitization to portrayals of real-life aggression as a function of exposure to television violence," *Journal of Personality and Social Psychology*, vol. 35, pp. 450-458, 1977.
- [13] J. B. Funk, H. B. Baldacci, T. Pasold, and J. Baumgardner, "Violence exposure in real-life, video games, television, movies, and the Internet: is there desensitization?" *Journal of Adolescence*, vol. 27, pp. 23-39, 2004.
- [14] C. A. Anderson, "An update on the effects of playing violent video games," *Journal of Adolescence*, vol. 27, pp. 113-122, 2004.
- [15] D. A. Gentile, P. J. Lynch, J. R. Linder, and D. A. Walsh, "The effects of violent video game habits on adolescent

- hostility, aggressive behaviors, and school performance," *Journal of Adolescence*, vol. 27, pp. 5-22, 2004.
- [16] C. A. Anderson and B. J. Bushman, "Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature," *Psychological Science*, vol. 12, pp. 353-359, 2001.
- [17] J. Sherry, "The effects of violent video games on aggression: A meta-analysis," *Human Communication Research*, vol. 27, pp. 409-431, 2001.
- [18] B. Krahe and I. Moller, "Playing violent electronic games, hostile attributional style and aggression-related norms in German adolescents," *Journal of Adolescence*, vol. 27, pp. 53-69, 2004.
- [19] A. Bandura, "Social cognitive theory and social referencing. In (Ed.), (pp.)." in *Social referencing and the social construction of reality*, S. Feinman, Ed. New York: Plenum Press, 1992, pp. 175-208.
- [20] A. Bandura, *Aggression: A social learning analysis*. Upper Saddle-River, NJ: Prentice-Hall., 1973.
- [21] A. Bandura, "Social Cognitive theory of mass communication," in *Media Effects: Advances in theory and Research*, J. B. a. D. Zillmann, Ed. Mahwah, NJ: Lawrence Earlbaum Associates, 2002, pp. 121-153.
- [22] L. Berkowitz and E. Rawlings, "Effects of film violence on inhibitions against subsequent aggression," *Journal of Abnormal and Social Psychology*, vol. 66, pp. 405-412, 1963.
- [23] A. Bandura, "Social Cognitive Theory: An Agentic Perspective," *Annual Review of Psychology*, vol. Annual 1, pp. 1, 2001.
- [24] R. G. Geen and D. Stonner, "Context effects in observed violence," *Journal of Personality and Social Psychology*, vol. 25, pp. 145-50, 1973.
- [25] J. Jansz, "The Emotional Appeal of Violent video games for adolescent males," *Communication Theory*, vol. 15, pp. 219-241, 2005.
- [26] C. A. Anderson and K. E. Dill., "Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life," *Journal of Personality and Social Psychology*, vol. 78, pp. 772-790, 2000.
- [27] S. J. Kirsh, "Seeing the world through mortal kombat-colored glasses. Violent video games and the development of a short-term hostile attribution bias," *Childhood*, vol. 5, pp. 177-184, 1998.
- [28] C. Heeter, "Being there: The subjective experience of presence," *Presence: Teleoperators and Virtual Environments*, vol. 1, pp. 262-271, 1992.
- [29] ISPR, "Resources for the study of presence: About Presence. Retrieved April 14, 2004, from <<http://www.ispr.info/>>." 2000.
- [30] [K. M. Lee, "Presence, Explicated," *Communication Theory*, vol. 14, pp. 27-50, 2004.
- [31] M. Slater, M. Usoh, and A. Steed, "Depth of presence in virtual environment," *Presence: Teleoperators and Virtual Environments*, vol. 3, pp. 130-144, 1994.
- [32] F. Biocca and K. L. Nowak, "Plugging your body into the telecommunication system: Mediated Embodiment, Media Interfaces, and Social Virtual Environments," in *Communication Technology and Society: Audience adoption and Uses*, D. Atkin and C. Lin, Eds. Cresskill, NJ: Hampton Press, 2002, pp. 407-447.
- [33] K. L. Nowak, "The Influence of Anthropomorphism and Agency on Social Judgment in Virtual Environments," *Journal of Computer Mediated Communication*, vol. 9, pp. available <http://jcmc.indiana.edu/vol9/issue2/nowak.html>, 2004.
- [34] M. Slater and M. Usoh., "Representations systems, perceptual position, and presence in immersive virtual environments," *Presence: Teleoperators and Virtual Environments*, vol. 2, pp. 221-233, 1993.
- [35] M. Lombard, R. D. Reich, B. E. Grabe, C. C. Bracken, and T. B. Ditton, "Presence and Television; The role of screen size," *Human Communication Research*, vol. 26, pp. 75-95, 2000.
- [36] D. F. Roberts, U. G. Foehr, and V. Rideout, "Generation M: Media in the lives of 8-18 year olds," Kaiser Family Foundation, Menlo Park, CA 2005, March.
- [37] L. M. Wilfred., "Learning in affectively intense virtual environments," in. Rolla. Retrieved December 10, 2005 from: [http://campus.umr.edu/lite/theses/2004\\_1\\_Wilfred\\_Lawrence.pdf](http://campus.umr.edu/lite/theses/2004_1_Wilfred_Lawrence.pdf): University of Missouri, 2004.
- [38] G. Gunter, *Dimensions of television violence*. Aldershots, England: Gower, 1985.
- [39] B. D. Bartholow and C. A. Anderson, "Effects of violent video games on aggressive behavior: Potential sex differences.," *Journal of Experimental Social Psychology*, vol. 38, pp. 283-290, 2002.
- [40] E. Huesmann, "Psychological processes promoting the relation exposure to media violence and aggressive behavior by the viewer," *Journal of Social Issues*, vol. 42, pp. 125-139, 1986.
- [41] M. Krcmar and M. C. Cooke, "Moral development and children's interpretations of justified and unjustified television violence," *Journal of Communication*, vol. 51, pp. 300-316, 2001.
- [42] S. L. Smith, B. J. Wilson, D. Kunkel, D. Linz, W. J. Potter, C. M. Colvin, and E. Donnerstein, "Violence in television programming: University of California, Santa Barbara study," in *National Television Violence Study*, vol. 3. Newbury Park, CA: Sage, 1998, pp. 5-220.
- [43] M. Lombard and T. Ditton, "Presence Measures," Temple University, Unpublished Manuscript February, 1999.
- [44] K. Nowak and F. Biocca, "The Effect of Agency and Anthropomorphism on Users' sense of Telepresence, Social Presence and Copresence in virtual environments," *Presence: Teleoperators and Virtual Environments*, vol. 12, pp. 481-494. MIT Press, 2003.
- [45] C. A. Anderson, W. E. Deuser, and K. DeNeve, "Hot tempers, hostile affect, hostile cognition and arousal: Tests of a general model of affective aggression," *Personality and Social Psychology Bulletin*, vol. 21, pp. 434-448, 1995.
- [46] A. H. Buss and M. Perry, "The Aggression Questionnaire," *Journal of Personality and Social Psychology*, vol. 63, 1992.
- [47] K. M. Farrar and M. Krcmar, "Measuring state and trait aggression: A short, cautionary tale," *Media Psychology*, In press.
- [48] A. M. Rubin, "A multivariate analysis of "60 Minutes" viewing motivations," *Journalism Quarterly*, vol. 58, pp. 529 - 534, 1981.