

The Comparison of Violent Video Games to a Virtual Reality Exposure Therapy Model

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As video games become increasingly realistic and aggressive there is growing concern over the possible generalization to real-life situations of learned aggressive behavior. To add to this concern, today's video game technology is very similar to that of virtual reality, which has been found to effectively change behaviors in clinical settings. Since many similarities exist between video games and virtual reality, it is possible that video games may elicit a similar change in behavior. Three tenets necessary for effective virtual reality exposure therapy, including complete immersion in the virtual environment, emotional arousal, and the generalization of the learned behavior to real-life situations, will be discussed and applied to video games (Krijn, Emmelkamp, Olafsson, & Biemond, 2004). Current literature and future research directions will be discussed.

Although video games have been available for over thirty years, the violent and realistic content of today's best selling games, such as *Grand Theft Auto Vice City™* and *Doom 3™*, can be traced back to 1992 with the debut of *Mortal Kombat™* (i.e., an interactive game of one-on-one fighting with human characters and gruesome graphics, Herz, 1997). Despite the fact that these violent games have been on the market for over a decade, it was not until the 1999 shooting at Columbine High School in Littleton, Colorado that concerns of their possible negative effects were so strongly voiced (Garbarino & Bedard, 2001). This incident sparked a great deal of debate primarily because the shooters, Dylan Klebold and Eric Harris, were avid players of the violent and aggressive game *Doom™*. It was reported that they had even gone so far as to make their own modified version of this particular game that they later reenacted during the massacre at their school (Hubbard, 1999).

Given that approximately 67% of households with children own a video game system (Subrahmanyam, Kraut, Greenfield, & Gross, 2001), it is not surprising that the video game industry earns more than twenty billion dollars in worldwide annual sales (Federal Trade Commission, 2000). In 2000, the Federal Trade Commission reported that of 118 "M" (i.e., mature) rated video games, 70% were directed at adolescents under the age of 17, and children between the ages of 13 and 16 were able to purchase these mature rated games approximately 85% of the time without

an adult present. Clearly, these statistics suggest that violent video games are not only being marketed to and sought after by children, but they are quite easily obtained. As recent evidence demonstrates that boys and girls spend 13 and 5 hours a week, respectively, playing video games—almost the equivalent of having a part-time job—(Gentile, Lynch, Linder, & Walsh, 2004), the question then becomes, what impact does playing violent video games have on individuals and their behavior?

Contextual Factors of Video Game Playing

Anderson and Bushman (2001) have applied a General Affective Aggression Model (GAAM) to violent media including video games. In this model they suggest that repeated exposure to violent video games increases the probability that an individual will think, feel, and behave more aggressively. This increase in aggressive responding is mediated by several variables, including the characteristics of the individual person, the situation or game to which they are exposed, the cognitive and affective excitement of the person, and the way the person appraises the situation. In terms of the contextual factors of the game, it has been found that the most desirable games are those that have the most realistic graphics and are highly interactive (Wood, Griffiths, Chappell, & Davies, 2004). It would seem to follow, then, that the more involved in a game the person becomes, the greater the possible effect of the game on their behavior. Moreover, games that require a player to take the first-person perspective may increase the level of interaction and lead to the possible priming of the player for aggressive thoughts and responses when handling real-life situations (Anderson & Bushman, 2001).

The realistic graphics and high level of interaction sought after in video games calls to mind a similar technological invention—virtual reality (VR) (Glantz, Rizzo, &

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Graap, 2003). Virtual reality allows the individual to be completely immersed in an alternate environment and experience situations they may not normally be exposed to (Krijn et al., 2004). Interestingly, virtual reality has most recently been demonstrated to elicit changes in patient's behaviors in therapeutic settings (Hoffman, 2004) for such problems as nicotine addiction (Lee et al., 2004) and fear of flying (Arbona, Osma, Garcia-Palacios, Quero, & Banos, 2004) to name just a few. These findings suggest that behavior can be changed with the assistance of a device that is very similar to video game consoles. While some critics may argue that violent video games do not increase the probability of an individual acting in a violent or aggressive manner (Olson, 2004), if the characteristics of video games and virtual reality are so similar, from the equipment used to the presentation of stimuli and virtual reality is found to facilitate therapeutic change, it seems only logical that video games may also have the ability to elicit a powerful change.

Exploring the Influence of Video Games

A meta-analysis of thirty-five research studies conducted by Anderson and Bushman (2001) supported the position that violent video games increase aggressive behavior not only in children, but also in many populations including male and female adults regardless of the experimental setting. In addition to an increase in aggressive behaviors, Anderson and Bushman also found a slight short-term reduction in pro-social behaviors (i.e., behavior executed to help another person) as well as a temporary increase in aggressive thoughts and emotions. Despite the limited availability of longitudinal data needed to provide evidence of more lasting effects, this research does support the position that playing violent video games can negatively impact an individual's behavior.

The increasing realism of video games leads one to return to the literature of virtual reality, specifically virtual reality exposure therapy (VRET). VRET combines the technology of virtual reality with the psychological technique of exposure therapy to provide individuals the opportunity to experience various stimuli in a controlled environment. It also affords clinicians the opportunity to submerge the patient in a controlled, anxiety-provoking situation without having to leave the office (Garcia-Palacios, Hoffman, See, Tsai, & Botella, 2001). Preliminary data on the use of VRET with such phobias as fear of driving (Walsh, Lewis, Kim, O'Sullivan, & Wiederhold, 2003) and fear of flying (Wiederhold, 2003; Arbona et al., 2004) have been optimistic in terms of creating a reduction in anxiety. According to Krijn et al. (2004) several conditions must be met for VRET to be effective, including complete immersion in the virtual environment, emotional arousal, and the application of the learned behavior to situations occurring in reality.

Similarities between VRET and Commercial Video Games

The first condition that must be met is complete immersion of the participant in the virtual reality world which is accomplished through equipment such as a head mounted device (HMD), a goggle-like mask that sits on the head and provides visual stimuli through small video screens and audio stimuli via headphones. While the stimuli are presented the individual can become immersed and unaware of anything occurring externally. Typically, a sensor is connected to the HMD so that all physical movements made by the client toward the stimuli are carried out in the virtual environment. Through these and other mechanisms, various stimuli may be presented visually, aurally, and when possible tactilely (Krijn et al., 2004).

The equipment available in most video game consoles appears to provide the same type of stimulation as the VR design. For example, Microsoft's game system XBOX™, like all game systems, has handheld controllers to manipulate the actions of the characters. Thus, just as in the VR environment, the actions of the player can be carried out in the digital world. While audio effects are typically amplified through television speakers, XBOX™ has capabilities for both headsets and surround-sound to enhance the intensity of the game. Although these features are available on most, if not all, of the game consoles currently being sold, XBOX™ is being highlighted because of its compatibility with some of the most violent games available including Doom 3™ and Halo 2™ (Walsh, Gentile, Gieske, Walsh, & Chasco, 2004). Not only are these games violent, but they are played from the first-person perspective which means the player is not seeing and reacting to the stimuli as a character, but rather as if he or she were in the environment, much like the VR stimuli. In addition, recent evidence demonstrates that highly engrossing graphics and game content are the most desirable characteristics in a video game (Wood et al., 2004), presumably because they keep individuals occupied for hours at a time and may prevent them from engaging in other activities.

Not only is the video game and virtual reality hardware similar, but both provide a degree of distraction from the outside world. Interestingly, playing video games has been found to successfully reduce the level of pain and other side effects experienced during various medical procedures, such as nausea associated with chemotherapy in young children (Redd et al., 1987). In addition, VR has also been shown to decrease the pulse of pediatric cancer patients, as well as the level of pain they experience (Gershon, Zimand, Pickering, Rothbaum, & Hodges, 2004). These findings indicate that amongst similarly aged children, both video games and virtual reality have provided a level of immersion that is even able to distract an individual from aversive stimuli. It is difficult to deny that this is a powerful effect.

The second condition necessary for effective VRET is

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to elicit an emotional response from the individual so as to engage him or her on a personal level (Krijn et al., 2004). To accomplish this, an environment that is salient to the person is employed. For example, when conducting VRET with a person who has aviphobia, or fear of flying, VR would be used to simulate an airplane environment (Maltby, Kirsch, Mayers, & Allen, 2002). If the stimulus does not elicit an anxious feeling which the person can learn to work through, it would seem impossible for the individual to successfully face his or her fear(s) in real-life situations. To objectively determine the effect the VR environment has on an individual, physiological measures are often employed. In particular, heart rate has been used as a way of measuring a person's reaction to the simulated environment and can be indicative of their affective response to the stimuli (Jang et al., 2002).

As in VRET, violent video games are replete with visual and audio effects designed to arouse the player. From rock music to conversations with other characters, these video games are able to pull the individual into, and sustain him or her in an alternate world (Wood et al., 2004). In light of the VRET literature, it appears that the physiological arousal achieved through violent video games is similar to that achieved in VR. One author relates her experience of playing video games, stating, "During especially difficult levels of play, my palms would sweat. My heart would race. I'd have knots in my stomach from anxiety" (Sohn, 2004, ¶2). To further support this author's experience, Anderson and Bushman's (2001) meta-analytic review found a significant elevation of diastolic (i.e., relaxed heart) and systolic (i.e., contracted heart) blood pressure, as well as heart rate when individuals were engaged in playing violent video games.

Anderson and Bushman (2001) also found a significant increase in aggressive affect, which they proposed was related to a heightened sense of anger or hostility in the player. Additional research by Panee and Ballard (2002) found this increase in hostile feelings, as well as physiological arousal, after participants played a violent video game. Thirty-six undergraduate students played a violent video game after being primed to either high or low aggressive acts. The high aggression condition was referred to as the "gun-shoot training mode," in which the participants were instructed to kill the guards in the video game with a gun. The low aggression condition was referred to as the "time attack training mode." These participants were told that it was not necessary to kill the guards in the game although they could do so if they chose. After being trained, all participants then played the video game *Metal Gear Solid*TM. They found that those individuals in the high aggression group engaged in more violent acts during the video game than those in the low aggression group. In terms of physiological and affective arousal, participants in the high aggression group had a greater increase in heart rate than the low aggression group, and self-report measures found that this increase in heart rate was correlated with greater feelings of hostility. These findings are con-

sistent with Anderson and Bushman's evidence that exposure to a high aggressive game increased the participant's physiological arousal. The self-reported feelings of increased hostility presents the possibility that violent behavior acted out in video games may increase the likelihood of an individual acting on these hostile feelings, which according to the GAAM model mentioned previously, can influence an individual's behavior in real-life situations (Anderson & Bushman, 2001). This leads to the third tenet of VRET.

The third condition necessary in VRET is that the learned behaviors generalize to real-life situations. For example, in treating someone who has a fear of spiders, the VRET is considered successful when the patient is able to control their anxiety in the presence of a spider outside of the therapeutic environment (Wiederhold & Wiederhold, 2005). In terms of violent video games, there is a great deal of controversy surrounding this issue of generalization (Anderson, 2004; Olson, 2004). However, there is research supporting the hypothesis that playing violent video games negatively influences the way a person thinks about and subsequently responds to an ambiguous situation.

For example, Kirsh (1998) compared fifty-two children in 3rd and 4th grade who played either a violent video game (*Mortal Kombat II*TM) or a non-violent video game (*NBA Jam*TM). After playing the video game, the child was read a story in which a character of the same gender as him or her caused a negative event to occur, but where the intent was not clear. Children who had played the violent video game were more likely to attribute the intent of the character to a negative, aggressive reason in half of the stories than their non-violent counterparts. In a sense, being shown the violent video game may have primed the children to respond in a negative manner; specifically, the violent content of the games may have put them in a negative frame of mind that led them to attribute the actions of the character to behaviors that were commensurate with these negative thoughts.

From Video Games to 'Real-Life'

To further understand how violent video games influence an individual's behavior in real-life situations, Anderson and Dill (2000) reported their findings from two separate studies. In the first they collected self-report data from 227 undergraduate students and correlated it with violent video game playing. The areas addressed included frequency and type of aggressive behavior, delinquency, and level of academic achievement as measured by the participant's grade point average. In addition, the individual's worldview was obtained by asking questions regarding the likelihood of crime occurring and their feelings of safety in various situations. The Caprara Irritability Scale (CIS) was used to assess the individual's impulsivity in responding to frustrating stimuli and the Buss-Perry Aggression Questionnaire was used to assess trait aggression in each participant. A video game questionnaire was created by the authors so that participants could identify their favorite

video games and rate the amount of violent content in each game on a scale of 1 (i.e., little to no violent content) to 7 (i.e., extremely graphic). Participants also reported the overall frequency with which they played video games. Results of this study revealed that playing violent video games was directly related to aggressive behavior as well as to non-aggressive (i.e., stealing) and aggressive (i.e., hitting) delinquency. It was also found that individuals who played violent video games had more aggressive personalities as per the CIS and Buss-Perry Aggression Questionnaire. However, there are several limitations to the application of these findings to the larger population. First, the undergraduate sample used poses a threat to the external validity of this study by making it difficult to generalize these findings to other groups. In addition the self-report measure by which data was collected threatens the internal validity of this study by making it difficult to establish a true cause and effect relationship. As such, the question remains: do hostile individuals seek these games out, or are they hostile because they play these games? The results of this study do provide valuable insight into the playing habits, personality styles, and aggressive behaviors of young adults and are an important contribution to the video game literature.

The second study Anderson and Dill (2000) conducted aimed to obtain a more accurate view of an individual's response to a real-life situation after playing a violent video game. In this study, they compared individuals' responses to a perceived opponent in a competitive computer game after playing either a non-violent or violent video game. Two hundred ten undergraduate students participated in this study after being screened for trait irritability. In the first session, participants played either a violent or non-violent video game and were then asked to fill out the State Hostility Scale. They continued playing for another fifteen minutes after which they engaged in a cognitive assessment of aggression that required each participant to read a list of aggressive and control words as quickly as possible. One week later the participants returned to the lab and played the violent or non-violent game from the previous session for fifteen minutes. They were then told that another participant in a separate cubicle would be playing against them in a competitive reaction task. The person who won would be able to send the other player a noise blast of different lengths and volumes, however, the intensity and duration of the blast was to be determined by the participant prior to each round. In reality there was no other player and the noise blasts were set in a pattern so all participants received an equal number of wins and losses. Results revealed that exposure to the violent video game was related to more aggressive behavior in the participant as evidenced by their delivery of longer lasting noise blasts to their "opponents" after they had lost the round prior to their winning.

Limitations of Current Research and Future Directions

It is difficult to truly examine the effects of violent video games on real-life aggression through the use of labo-

ratory experiments and/or retrospective self-report measures, which are not always the most generalizable sources of data. It is also important that sweeping generalizations not be made based on anecdotal evidence, such as blaming all acts of teen violence on violent video games or other sources of violent media these individuals may be exposed to. Ultimately, not every individual exposed to these games reacts aggressively because individual differences always exist. Anderson and Bushman (2001) take the individual into account when applying the General Affective Aggression Model suggesting that not every one who plays these games will react aggressively. An example of how individual differences may affect a person's response can be found in the study by Anderson and Dill (2000) described previously. Some of the participants may have been more hostile by nature than others causing them to respond more aggressively when they believed they were playing against another person. Therefore, they may have responded aggressively regardless of what game they had been given prior to competing. However, it is important that we not overlook the impact these games may have on the cognitions and behaviors of their players.

With the increasing availability of virtual reality hardware and software and the compatibility of such programs with desktop personal computers, this area of research may be more easily studied than in previous years (Riva, 2003). For those who have access to such technology, future research may take several approaches to explore the similarities and differences of violent video games and virtual reality. Following is an example of one possible study that could be applied in a laboratory setting and that would consider individual differences in the domain of hostile personality: In the first step, participants would be prescreened using a measure, such as the Buss-Perry Aggression Questionnaire, and those individuals who scored in the top and bottom 25th percentiles would be included in the study in order to evenly distribute individuals who are high and low in aggressive personality traits and control for individual differences. In the second step, participants would be assigned to one of six groups based on their scores on the Buss-Perry Aggression Questionnaire including: high or low aggression and violent video games, high or low aggression and virtual reality, and high or low aggression and a neutral task, such as putting together a puzzle. Next, each participant would engage in the assigned activity for fifteen minutes after which time self-report data of aggressive feelings would be collected using a measure such as the State Hostility Scale. Physiological arousal data would be obtained before, during, and after each participant engaged in the assigned activity via heart rate and blood pressure. Finally, after participants completed the self-report questionnaire they would engage in a laboratory activity that would mimic a real-life situation, such as helping a confederate or another participant try to solve a posed problem, to determine whether or not there is an effect on their level of frustration and frequency of verbal and non-verbal aggressive behaviors. Frustration would be measured by the num-

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ber of attempts made at completing the task, verbal aggression would be measured by the frequency of negative utterances, and non-verbal aggression would be measured by the frequency of negative actions, such as slamming hands on a table. This data would be collected by a blind observer to reduce the probability of expectancy effects.

If the proposed study were carried out it would be expected that significant differences would arise between the hostile and non-hostile groups in all three conditions in their scores on the State Hostility Scale. Significant differences would also be expected between the low and high aggression neutral task group and the high aggression VR and high aggression video game groups in terms of physiological arousal, level of frustration, and verbal and non-verbal aggression. By prescreening individuals it would be possible to determine the differences that exist between the groups when given the various activities. Based on the theoretical assumptions presented above, it is hypothesized that no significant differences would exist between the video game and virtual reality groups.

Although the proposed study is just an example of how future research might explore this area, it is important, from a clinical perspective, to further understand the mechanisms of change in behavior that playing video games may have on individuals. In considering the characteristics of VRET and violent video games, it is interesting to note the similarities of the environment created and the effects of the stimuli on the participant. Although there is a relatively small amount of literature available on both virtual reality and violent video games, it is possible to make the theoretical hypothesis that because VRET can elicit changes in people's behaviors and there are strong similarities between video games and virtual reality, violent video games may also elicit the same types of change in behavior.

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