The effect of video game violence on physiological desensitization to real-life violence ☆

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Abstract

Past research shows that violent video game exposure increases aggressive thoughts, angry feelings, physiological arousal, aggressive behaviors, and decreases helpful behaviors. However, no research has experimentally examined violent video game effects on physiological desensitization, defined as showing less physiological arousal to violence in the real world after exposure to video game violence in the virtual world. This experiment attempts to fill this gap. Participants reported their media habits and then played one of eight violent or nonviolent video games for 20 min. Next, participants watched a 10-min videotape containing scenes of real-life violence while heart rate (HR) and galvanic skin response (GSR) were monitored. Participants who previously played a violent video game had lower HR and GSR while viewing filmed real violence, demonstrating a physiological desensitization to violence. Results are interpreted using an expanded version of the General Aggression Model. Links between desensitization, antisocial, and prosocial behavior are discussed.
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Over the last three decades the video game industry has evolved from offering a handful of games on bulky home systems to offering scores of video games on console systems, personal computers, handheld systems, PDAs, and even cell phones. Accompanied with the success of this thriving industry has been public debate concerning the impact of video game exposure. Currently, one of the primary public and political issues concerns the effect of exposure to excessively violent video games on aggression and violence.

One reason for this debate is the high prevalence of violence in current video games. Over 85% of games contain some violence, and approximately half of video games include serious violent actions (e.g., Children Now, 2001). Video games rated "E" (Everyone: Ages 6+) by the indus-

try are rated as considerably violent by parents (Thompson & Haninger, 2001). In addition, the Federal Trade Commission found that many game manufacturers market violent games to children (FTC, 2000).

Another reason for this debate is the abundance of research demonstrating negative effects of violent media exposure. Youth exposed to violent media tend to become more aggressive immediately after exposure, and become more aggressive adults (e.g., Anderson et al., 2003). The effect of violent television exposure at an early age (between 6 and 11 years old) on later violent behavior has been shown to be larger than the effects of low IQ, abusive parents, exposure to antisocial peers, and being from a broken home (US Department of Health & Human Services, 2001). The smaller video game literature has found that playing violent video games causes increases in aggressive behavior, aggressive affect, aggressive cognitions, physiological arousal, and decreases in prosocial behavior (Anderson et al., 2004). But what does the media violence research

literature have to say about *desensitization*? The answer is: both too little and too much.

In 1982, the US Surgeon General called for research on whether video game violence desensitizes individuals to real violence (Koop, 1982). Unfortunately, there is no published research on this specific topic, and the public debate frequently generates more heat than light.

Desensitizing effects of violent entertainment media

The term "desensitization" has been used by scholars, public policy analysts, politicians, and the lay public to mean effects as varied as: (a) an increase in aggressive behavior; (b) a reduction in physiological arousal to real-life violence; (c) a flattening of affective reactions to violence; (d) a reduction in likelihood of helping a violence victim; (e) a reduction in sympathy for a violence victim; (f) a reduction in the sentence for a convicted violent offender, (g) a reduction in the perceived guilt of a violence perpetrator; and (h) a reduction in judged severity of a violence victim's injuries. This hodge-podge of definitions—confusing lay people and scientists alike—results from a failure to distinguish underlying psychological desensitization *processes* from potential desensitization *effects* on other responses. Too much is included in this broad definition.

A narrower, clearer definition of desensitization to violence is *a reduction in emotion-related physiological reactivity to real violence.* This definition fits well with earlier systematic desensitization research in cognitive-behavioral treatment of phobias (e.g., Wolpe, 1958, 1982). Systematic desensitization—a set of procedures designed to reduce unwanted negative emotional reactions to stimuli that initially produce fear or anxiety—has been successfully used to treat fear of such things as spiders (Bandura, Reese, & Adams, 1982), snakes (Bandura & Adams, 1977), and blood (Elmore, Wildman, & Westfield, 1980). It has been used to treat anxiety-related disorders such as post-traumatic stress (Pantalon & Motta, 1998), rape trauma (Frank, Anderson, Stewart, Dancu, & West, 1988), and nightmares (Schindler, 1980). There is also evidence that the US military has used video games for a variety of training missions, including desensitizing soldiers to violence (Grossman & DeGaetano, 1999).

Whether induced intentionally (e.g., therapeutic systematic desensitization) or unintentionally, desensitization can be adaptive, allowing individuals to ignore irrelevant stimuli and attend to relevant stimuli. For example, desensitization to distressing sights, sounds, and smells of surgery is necessary for medical students to become effective surgeons. Desensitization to battlefield horrors is necessary for troops to be effective in combat. However, desensitization of children and other civilians to violent stimuli may be detrimental for both the individual and society.

Media violence and physiological desensitization

There are surprisingly few media violence studies examining physiological–emotional indicators of desensitization.

Due to ambiguity on how to operationalize desensitization, research on this phenomenon is also somewhat unclear. One of the earliest studies demonstrating the potential desensitizing effect of violent media measured GSR of individuals while they watched a documentary film of a tribal ceremony that included making incisions on the human body (Lazarus, Speisman, Mordkoff, & Davison, 1962). Participants' had lower GSRs during incisions at the end of the film than at the beginning; early scenes of gore apparently reduced physiological arousal to later scenes.

Other experimental research has yielded similar results. Participants in one study who viewed a series of "slasher" film clips had lower heart rates when shown additional violent movie clips than did participants who initially viewed nonviolent clips (Linz, Donnerstein, & Adams, 1989). Children in another study who saw a violent movie had lower GSR to a staged "real-life" violent scene than did children who had previously viewed a nonviolent movie (Thomas, Horton, Lippincott, & Drabman, 1977). Similar results were found in an adult population (Thomas et al., 1977). In a related study, college students who had been provoked and had viewed a violent film clip had lower heart rate before and after shocking their provoker than did students who viewed a nonviolent film clip (Thomas, 1982).

Other research has demonstrated that past violent media exposure correlates with physiological desensitization to violence (e.g., Cline, Croft, & Courrier, 1973). For example, one study found that past violent video game exposure was related to reduced P300 amplitudes when exposed to violent photos, even after controlling for initial levels of aggressiveness (Bartholow, Bushman, & Sestir, 2006).

Although these studies are important and insightful, none directly address the issue of whether exposure to violent media physiologically desensitizes individuals to real-life violence. The main public concern with desensitization to violence is not that viewing media violence lowers physiological responsiveness to other media violence, but that it lowers responsiveness to real world violence.

For a direct, causal test of the hypothesis that exposure to violent media can cause physiological desensitization to real-life violence, four experiment characteristics are necessary: (1) random assignment to violent or nonviolent media exposure groups; (2) use of violent and nonviolent entertainment media that are equivalent (or statistically controlled) on various nonviolent aspects (such as excitement, frustration, involvement level); (3) use of emotion-related physiological indicators as the dependent variable (e.g., heart rate, GSR); and (4) use of real violence as the emotion-provoking stimulus in the dependent variable assessment (this provides more generalizable findings compared to measuring desensitization to fictitious violence). None of the prior studies meet all four criteria. Furthermore, no published study has experimentally examined whether exposure to violent video games decreases physiological responsiveness to real-life violence.

GAM, desensitization, and sequela

There are theoretical reasons for expecting violent media to desensitize individuals to real-life violence in both short-term (within 1 hour of exposure) and long-term (repeated exposure) contexts. The General Aggression Model (GAM) provides a useful social-cognitive framework for understanding desensitization processes.

GAM has been described in detail elsewhere (e.g., Anderson & Bushman, 2002; Anderson & Carnagey, 2004; Anderson & Huesmann, 2003), so it will be described only briefly here. Aggressive behavior is based on the learning, activation, and application of aggression-related knowledge structures stored in memory. Such learning takes place through encounters with the physical and social world. Much learning occurs through observing real and fictional characters.

In this article, we extend GAM to desensitization effects. In our model, "desensitization" is best seen as a process by which initial arousal responses to violent stimuli are reduced, thereby changing the individual's "present internal state." GAM further specifies that subsequent decision and behavioral processes will be influenced. Fig. 1 details how exposure to violent video games might produce physiological–emotional desensitization, and how desensitization influences other aggression and helping-related variables.

The initial response of children and many adults to violent media is fear and anxiety (e.g., Cantor, 1998). When violent stimuli are repeatedly presented in a positive emotional context (e.g., exciting background music, sound effects, visual effects, rewards for violent actions in the game), these initial distressing reactions are reduced. One indicator that desensitization has occurred is observation of a reduction in physiological arousal (e.g., heart rate, GSR) during exposure to real violence after individuals have been repeatedly exposed to media violence.

Once desensitization has occurred, new presentations of real violence instigate different cognitive and affective reactions than would have occurred in the absence of desensitization. For example, desensitized people might be less likely to notice aggressive events, perceive fewer or less severe injuries, feel less sympathy for violence victims, believe that the world is a less safe place, and have less negative attitudes towards violence. These cognitive and affective sequela are critical determinants of subsequent episodic decisions and actions.

Overview

In this experiment, participants first completed measures of video game preferences and trait aggressiveness. Participants then played either a violent or nonviolent video game for 20 min. Afterwards, they watched a 10-min videotape containing filmed scenes of real violence while heart rate (HR) and galvanic skin response (GSR) were continuously monitored. Finally, participants rated the video game they played on several dimensions. We predicted that violent game players would show less physiological arousal (lower HR and GSR) in response to real-life violence than would nonviolent game players.
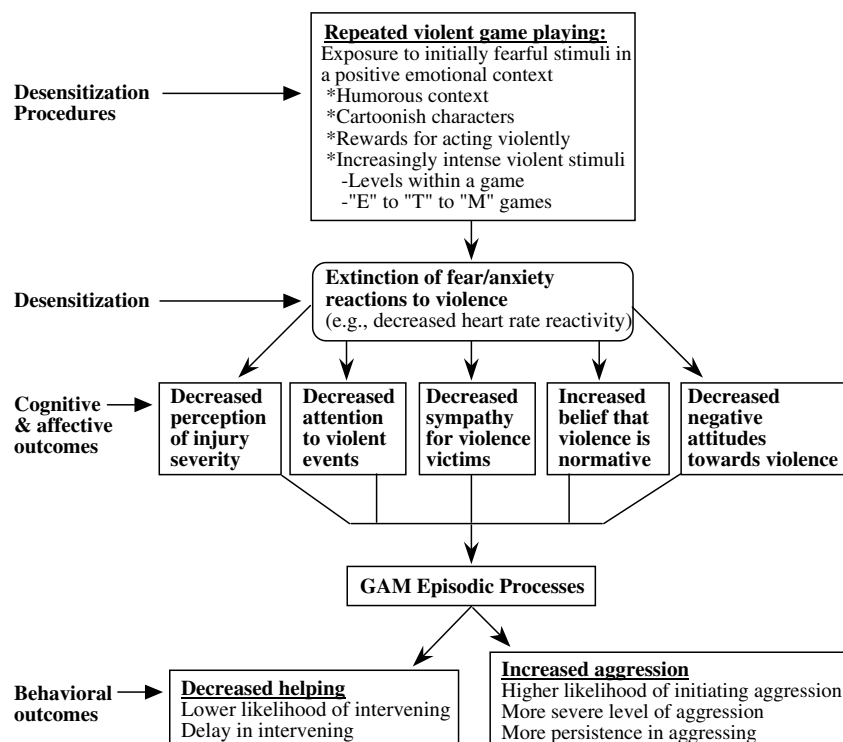

Fig. 1. Media violence desensitization processes: integration of systematic desensitization, helping, and aggression models.

Method

Participants

Participants were 257 college students (124 men and 133 women) who received extra course credit in exchange for their voluntary participation.

Procedure

Participants were tested individually. They were told that the purpose of the study was to evaluate different types of media. After consent procedures were completed, 5 min baseline HR and GSR measurements were taken, using finger electrodes placed on the three middle fingers of the non-dominant hand.[1] During the baseline period, participants reported the number of hours per week they spent playing video games and the percent of time spent playing violent video games (preference for violent video games).[2] They also completed the nine-item Physical Aggression subscale of the Aggression Questionnaire (Buss & Perry, 1992).[3] A sample item is: "Given enough provocation, I may hit another person." Coefficient α was .84.

After 5 min, the experimenter removed the electrodes. Participants played a randomly assigned violent or nonviolent video game for 20 min. To make the findings more generalizable (Wells & Windschitl, 1999), we used four violent games (*Carmageddon*, *Duke Nukem*, *Mortal Kombat*, *Future Cop*) and four nonviolent games (*Glider Pro*, *3D Pinball*, *3D Munch Man*, *Tetra Madness*).

After game play, a second set of 5-min HR and GSR measurements were taken. Next, participants watched a 10-min videotape of real violence in four contexts: courtroom outbursts, police confrontations, shootings, and prison fights. These were actual violent episodes (not Hollywood reproductions) selected from TV programs and commercially released films. In one scene, for example, two prisoners repeatedly stab another prisoner. HR and GSR were monitored continuously while they watched the real-life violence. Participants then rated the video game they had played on the following dimensions: action-packed, frustrating, enjoyment, fun, absorbing, arousing, boring, entertaining, exciting, involving, stimu-

lating, and addicting, and violent, using 10-point scales ranging from 1 (*strongly disagree*) to 10 (*strongly agree*). Finally, they were debriefed.

Results

Preliminary analyses

Within each type of video game (i.e., violent, nonviolent), we tested whether the four different games produced different effects on HR and GSR. No significant differences were found among the four violent or among the four nonviolent games on HR or GSR. The random-effects variance estimates for video game exemplars ranged from 0 to 4.43 ($M = 1.06$). None of the maximum likelihood random-effects variance estimates significantly differed from zero, ps > .05. Thus, the data were collapsed across exemplars of video game types for subsequent analyses.

As expected, violence ratings were higher for the violent video games than for the nonviolent video games, Ms = 4.87 and 1.70, $F(1, 252) = 529.67$, $p < .0001$, $d = 2.90$. However, violent and nonviolent video games also differed on several other dimensions. Compared to the nonviolent games, the violent games were rated as being more action packed, Ms = 5.31 and 3.17, $F(1, 252) = 53.48$, $p < .0001$, $d = 0.92$, more frustrating, Ms = 5.79 and 4.63, $F(1, 252) = 14.30$, $p < .001$, $d = 0.48$, less enjoyable, Ms = 3.95 and 4.95, $F(1, 252) = 11.73$, $p < .001$, $d = 0.43$, and less fun, Ms = 4.00 and 4.81, $F(1, 252) = 6.84$, $p < .01$, $d = 0.33$. Violent and nonviolent games did not differ on absorbing, arousing, boring, entertaining, exciting, involving, stimulating, or addicting ratings, Fs(1, 252) < 3.10, ps > .08, ds < 0.22. Dimensions that yielded nonsignificant effects were dropped. Others were used as covariates in the main analyses.

Main analyses

Heart rate[4]

HR data were analyzed using a 2 (video game exposure: violent, nonviolent) × 2 (participant gender) × 3 (measurement time: baseline, after video game, during film) mixed design, with additional planned contrasts testing the main hypotheses. The video game exposure and participant sex factors were between-subjects, whereas the measurement time factor was within-subjects. We initially considered trait aggression, preference for violent games, and rated nonviolent game characteristics as possible covariates or moderators, but they were unrelated to HR during real violence viewing and were therefore dropped.

The time main effect was significant, $F(2, 496) = 9.70$, $p < .001$. Adjusted average HRs were 66.0, 68.8, and 69.6 at

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[1] Due to random hand movements during measurement periods, some data sections containing impossible HR estimates were deleted before average HRs were calculated.

[2] On average, men spent 4.15 h ($SD = 5.11$) per week playing video games, whereas women spent 1.43 h ($SD = 2.67$). On average, men spent 42% ($SD = 36\%$) of this time playing violent games, whereas women spent 4% ($SD = 12\%$) of this time playing violent games. Such self-reports likely underestimate the actual proportion of time spent playing violent games because most game players do not regard cartoon violence as "violence" (Anderson, Gentile, & Buckley, in press; Potter, 1999).

[3] Preference for violent video games was positively correlated with self-reported physical aggression, $r(255) = .32$, $p < .0001$. The amount of time spent playing video games in general was correlated with level of physical aggressiveness, $r(255) = .16$, $p < .02$, but this latter correlation was significantly smaller than the former one, $t(253) = 2.22$, $p < .05$.

[4] Two participants in the nonviolent video game group (1 woman, 1 man) and three participants in the violent video game group (2 women, 1 man) were excluded from the HR and GSR analyses due to equipment malfunctions.

baseline, post-gameplay, and during the film, respectively. As expected, HR increased from baseline to post-game play, $F(1,248) = 9.40$, $p < .05$, $d = 0.39$ (see Fig. 2). The only other effect that approached significance was the game violence x time interaction, $F(2,496) = 2.06$, $p < .13$. Fig. 2 displays the means. All other $Fs < 1$.

There were no HR differences between violent and nonviolent conditions during baseline [$Ms = 66.4$ and 65.5, respectively, $F(1,248)=0.43$, $p>.05$, $d = 0.08$] or after game play, $Ms=69.3$ and 68.4, respectively, $F(1,248)=0.55$, $p> .05$, $d = 0.09$ (see Fig. 2). Because we expected the interaction between video game content and measurement time to have a specific form (i.e., a spreading interaction rather than a cross-over one), we tested it using two planned contrasts. The first contrast tested the effect of video game content on heart rate differences at baseline versus after playing the video game. Because we attempted to match the violent and nonviolent video games in terms of how arousing they were, we did not expect any heart differences after playing the video game. As expected, the first contrast was small, $F(1,248) = 0.00$, $p > .05$, $d = 0.00$. This small contrast suggests that increases in HR during game play were essentially the same for the violent and nonviolent game conditions.

The second (key) contrast tested the effect of video game content on HR during the showing of the real-life violence, versus the average HR during the other two time periods. As expected, the second contrast was large, $F(1,248)=4.86$, $p <.05$, $d=0.28$ (see Fig. 2). This large contrast suggests that violent game players were less aroused by the real-life violence than were nonviolent game players. People who had recently played a violent video game were less aroused by the filmed violence than were those who had recently played a nonviolent video game. Indeed, heart rates of nonviolent game players increased while viewing the film (relative to post-game HR), $F(1,131)=16.60$, $p<.05$, $d=.72$, whereas heart rates of violent game players did not change while viewing the filmed real violence, $F(1,116)=.41$, $p>.05$, $d=.11$.

Galvanic skin response

The same procedure was used to analyze GSR, except that three of the rated game characteristics (action, involve, fun) were used as covariates because they yielded significant effects either in the overall analysis or in one of the planned contrast analyses. Neither trait aggression nor past violent video game exposure yielded any reliable effects in preliminary analyses, so they were not included in analyses reported here.

The 2x2x3 ANCOVA yielded a significant main effect of gender, $F(2,244) = 18.06$, $p < .001$, $d = 0.54$, with women being higher in GSR than men ($Ms = 302.98$ and 234.68). In addition, there was an uninteresting time X gender interaction, $F(2, 244) = 5.36$, $p < 005$. Women were higher than men at baseline [$Ms = 297.22$ and 243.19, $F(2,244) = 10.53$, $p < .01$, $d = 0.42$], after game play [$Ms = 303.12$ and 239.85, $F(2,244) = 14.89$, $p < .001$, $d = 0.49$], and during viewing of real-life violence [$Ms = 308.62$ and 221.01, $F(2,244) = 22.51$, $p < .001$, $d = 0.61$]. Unlike HR, there was not an overall change in GSR across time, $F(2, 488) = 0.91$, $p >.40$.

Similar to HR, there were no GSR differences between violent and nonviolent conditions during baseline [$Ms = 258.98$ and 281.4, respectively, $F(1, 244) = 1.19$, $p >.25$, $d = 0.14$] or after game play, T2 $Ms = 261.8$ and 281.1, respectively, $F(1, 244) = 0.91$, $p > .30$, $d = 0.12$ (See Fig. 3). The interaction between video game content and measurement time was again tested using two planned contrasts. The first contrast testing whether game violence differentially affected GSR from baseline to post-gameplay was again small, $F(1, 244)=0.05$, $p>.80$, $d=0.03$ (see Fig. 3). This contrast demonstrates that change in GSR was similar for violent and nonviolent game players.

The second (key) contrast comparing the average of the GSRs during baseline and post-gameplay to GSR during the viewing of the filmed real violence was large,
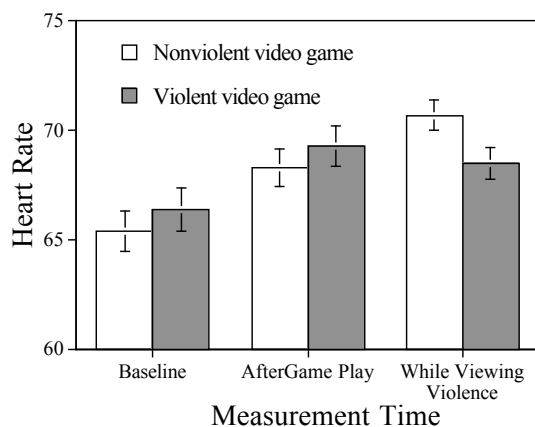

Fig. 2. Heart rate at baseline, after playing a video game, and while watching filmed real-life violence for violent and nonviolent video game players. Mean heart rates for violent and nonviolent video game players during the viewing of filmed real-life violence were 68.5 and 70.7, respectively. All means are adjusted for gender. Capped vertical bars denote 1 SE.
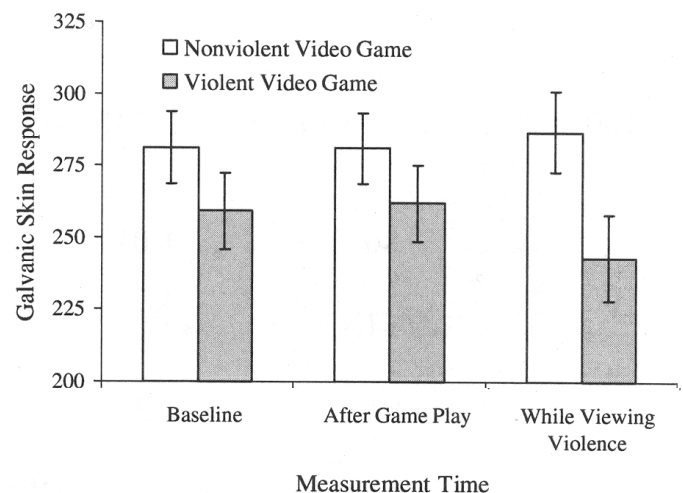

Fig. 3. Galvanic skin response at baseline, after playing a video game, and while watching filmed real-life violence for violent and nonviolent video game players. Mean GSR scores for violent and nonviolent video game players during the viewing of filmed real-life violence were 242.9 and 286.8, respectively. All means are adjusted for gender, how fun and involving the video games were, and how much action the video games contained. Capped vertical bars denote 1 SE.

$F (1, 244) =4.67, p <.05, d =0.28$ (see Fig. 3). This large contrast demonstrates that violent game players were less aroused by the real-life violence than were nonviolent game players. Participants who had just played a violent video game experienced relatively less arousal during the viewing of the filmed violence. Furthermore, nonviolent game participants had a slight (nonsignificant) increase in GSR while viewing the film, $F(1, 127) = 0.52, p >.05, d =0.13$, whereas violent game participants showed a decrease in GSR, $F (1, 113) = 7.19, p <.05, d = 0.50$. Several effects of rated video game characteristics were also significant: action, $F (1, 244) = 6.00, p < .05$; fun, $F (1, 244) = 7.95, p < .05$; involving, $F (1, 244) =4.41, p < .05$. The higher rated level of action and involvement in the games, the larger the increase in GSR from the composite baseline to during the viewing of real-life violence, $r =.13, b =5.96, p < .05$ and $r =.11, b =6.09, p <.05$. The less fun the games were rated, the larger the increase in GSR from baselines to during the viewing of real-life violence, $r =.02, b =7.88, p <.05$.

Discussion

The results demonstrate that playing a violent video game, even for just 20 min, can cause people to become less physiologically aroused by real violence. Participants randomly assigned to play a violent video game had relatively lower HR and GSR while watching actual footage of people being beaten, stabbed, and shot than did those randomly assigned to play a nonviolent video game.

One issue that arises frequently in the media violence literature concerns individual differences in susceptibility to media violence effects. If there are large individual differences in susceptibility to short-term desensitization effects, they would be revealed in the present study as significant interactions between the individual difference variables (violent video game preference; trait aggressiveness; gender) and the experimental manipulation of game violence. We found no such interactions, suggesting that the results are quite robust across individuals.

Relevance of results to GAM

Although the present experiment did not measure aggressive or helping behaviors, we think our extension of the GAM in Fig. 1 can explain such behaviors (see Fig. 1). Desensitization to violence can increase aggression in several ways. For example, when considering several possible behavioral scripts for guiding action, children who have strong negative reactions to a violent script are less likely to use it than those who have either a neutral or a positive reaction to it (Anderson & Huesmann, 2003; Huesmann, 1998). Exposure to violent video games can increase aggression in ways that are largely unrelated to desensitization as well, but because the present study focuses on desensitization our discussion (and Fig. 1) emphasize effects on helping behavior.

Helping researchers have demonstrated numerous factors that yield decreases in helping (for a review, see Batson, 1998), but the link between desensitization and helping behavior has not been as carefully examined. Two lines of research are most relevant to GAM and helping: (1) the work by Latane and Darley (1968), and (2) research examining helping as a function of tension reduction.

After the 1964 murder of Kitty Genovese in New York City, Latane and Darley were motivated to conduct experimental studies to find out why people did not help her. Newspapers reported that several witnesses watched Genovese being assaulted for 30 min, yet none called the police or attempted to intervene. Their studies found that several factors are required for intervention to occur. Three of these factors are particularly relevant to GAM's link between desensitization and failure to help violence victims (see Fig. 1). First, the individual must notice or attend to the violent incident. Desensitization might reduce attention to violent incidents involving other people. Second, the individual must recognize the event as an emergency. Desensitization might reduce the perceived seriousness of injury, and thereby decrease the likelihood of perceiving the situation as an emergency. Third, the individual must feel personally responsible to help. Desensitization might reduce sympathy for the victim, increase beliefs that violence is normative, and decrease negative attitudes towards violence, thereby decreasing feelings of personal responsibility.

Similarly, research has shown that people are more likely to help when they are highly aroused (Dovidio, Piliavin, Gaertner, Schroeder, & Clark, 1991). Other helping researchers have proposed that observation of a victim produces a state of aversive tension that can motivate helping behavior (e.g., Cialdini & Kendrick, 1976). In both cases, individuals desensitized to violence should be less likely to help a violence victim.

Several studies have examined the effects of violent television on children's helping behavior (e.g., Drabman & Thomas, 1974). Children were exposed to a short violent or nonviolent television program, and then were exposed to a situation in which they could intervene in a fight they believed was occurring in another room by calling an adult. Participants exposed to a violent TV program took longer to intervene than did those exposed to a nonviolent TV program. But the researchers did not test whether the violent TV program used could produce physiological desensitization in the target population.

Similarly, several studies have found decreases in prosocial behavior as a result of exposure to violent video games (e.g., Silvern & Williamson, 1987). But again, there was no evidence in these studies that the violent games produced physiological desensitization in the target population. Furthermore, none of these studies examined prosocial behavior towards a violence victim.

In sum, GAM is relevant to media violence desensitization in two ways. First, the social-cognitive-learning

aspects predict that exposure to violent entertainment media will decrease normal negative emotional-physiological reactions to real violence. The current experiment tested this hypothesis, using violent video games as the entertainment medium, heart rate and galvanic skin response as the physiological measures, and filmed real-world violence as the stimulus during dependent measure assessment. Second, GAM predicts that violent entertainment stimuli that produce physiological desensitization will also decrease helping a violence victim. A recent study has found such results (Bushman, Shlecter, Anderson, & Carnagey, in preparation).

Future research

Numerous important theoretical questions remain for future research. Several features of violent video games suggest that they may have even more pronounced effects on users than violent TV programs and films. Violent video game players are more actively involved, more likely to identify with violent characters, more directly reinforced for violent acts, and more frequently exposed to violent scenes. In the past, the level of realism in video game images might have reduced their ability to create physiological desensitization. But recent technological advances have removed this obstacle from video games. Consequently, desensitization and decreases in helping might well progress more quickly and efficiently in violent video game players than in violent TV/film viewers. Future research should investigate how these differences between types of entertainment media influence desensitization to real violence. Future research also should investigate who is most likely to become desensitized as a result of exposure to violent video games.

Another question concerns the duration of desensitizing effects of violent video games. Although no studies have been conducted on this topic, some violent film studies show that without repeated exposure, the laboratory effects of media violence exposure on perceived victim injury can deteriorate in a matter of days (Mullin & Linz, 1995). Of course, most youths and many adults are exposed to violent media on a regular basis.

Finally, although our main focus has been on unintended desensitization and helping effects of violent video games, a better understanding of video game effects can be put to good use in other contexts. For example, if violent video games designed primarily to entertain are good at producing physiological desensitization, then it should be feasible to design games to produce such desensitization in desired populations and contexts. Can we make better combat soldiers by desensitizing them to some of the sights and sounds of combat? Can we help medical students become comfortable with the types of physical and emotional trauma they will experience in emergency rooms? Can we use video games to systematically desensitize individuals who need to be desensitized to specific stimuli that cause them problems (e.g., auto accident victims afraid of riding or driving again)?

Conclusion

The present experiment demonstrates that violent video game exposure can cause desensitization to real-life violence. In this experiment, violent game players were less physiologically aroused by real-life violence than were nonviolent game players. It appears that individuals who play violent video games habituate or "get used to" all the violence and eventually become physiologically numb to it.

The integration of systematic desensitization processes and models of helping behavior with GAM is heartening in the insights provided to a long-standing and somewhat muddled research literature. But it is also frightening in some of its implications. The existing rating systems (Bushman & Cantor, 2003), the content of much entertainment media, and the marketing of those media combine to yield a powerful desensitization intervention on a global level. Children receive high doses of media violence. It initially is packaged in ways that are not too threatening, with cute cartoon-like characters, a total absence of blood and gore, and other features that make the overall experience a pleasant one, arousing positive emotional reactions that are incongruent with normal negative reactions to violence. Older children consume increasingly threatening and realistic violence, but the increases are gradual and always in a way that is fun. In short, the modern entertainment media landscape could accurately be described as an effective systematic violence desensitization tool. Whether modern societies want this to continue is largely a public policy question, not an exclusively scientific one (Anderson et al., 2003; Gentile & Anderson, 2006).

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