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FlashReport

Viewing the world through "blood-red tinted glasses": The hostile expectation bias mediates the link between violent video game exposure and aggression ☆

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ABSTRACT

Research has clearly shown that violent video games can increase aggression. It is less clear why they do. This study investigates the mediating effect of the hostile expectation bias (i.e., tendency to perceive hostile intent on the part of others) on the link between violent video game exposure and aggression. French college students ($N = 136$) played either a violent or nonviolent game for 20 minutes. Afterwards, they read ambiguous story stems about potential interpersonal conflicts, and listed what they thought the main characters would do or say, think, and feel as the story continued. Aggression was measured using a competitive computer game in which the winner could blast the loser with loud noise through headphones. As hypothesized, video game violence increased the hostile expectation bias, which, in turn, increased aggression. Effects were larger for men than women. Thus one reason why violent games increase aggression is because they increase hostile expectations.

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"We live in the midst of alarms; anxiety beclouds the future; we expect some new disaster with each newspaper we read."

—Abraham Lincoln (1809–1865), 16th U.S. President

Even in the 1800s the media influenced the expectations people had about what was currently happening, and what would happen in the future. Abraham Lincoln expected to read about a new disaster each time he picked up a newspaper. The news of these disasters not only influenced his expectations, but also his emotions. Expecting a disaster produced feelings of anxiety.

In the news today, a common phrase is: "If it bleeds, it leads." Violent news stories often become the leading news stories. Violence is a common theme, not just in the news, but in all forms of media, including video games (e.g., Dill, Gentile, Richter, & Dill, 2005), television programs (e.g., National Television Violence Study, 1998), and even G-rated movies (Yokota & Thompson, 2000). People today expect violent content from the media, and they often get it.

Over time, the media are becoming more and more violent. This is especially true of video games. In the past, violent video games featured cartoonish characters and stylized blood and gore. Today, the characters, blood, and gore are extremely realistic in many games. The present research investigates whether violent video games influence expectations about how others will respond in situations of potential conflict, and whether these hostile expectations, in turn, will influence subsequent aggression. Much like news stories about disasters can lead to expectations of future disasters and subsequent anxiety, we predict that violent games can lead to hostile expectations and subsequent aggression.

Using the general aggression model to understand violent video game effects

A recent meta-analysis of over 130 research reports involving over 130,000 participants found that violent games increase aggressive thoughts, angry feelings, and aggressive behaviors, and decrease empathic feelings and prosocial behaviors (Anderson et al., 2010; for an alternative view see Ferguson & Kilburn, 2010, and response by Bushman, Rothstein, & Anderson, 2010). The present research moves beyond the question of whether violent video games increase aggression to focus instead on the important question of why violent video games increase aggression.

The General Aggression Model provides a useful framework for understanding violent video game effects (e.g., Anderson & Bushman,
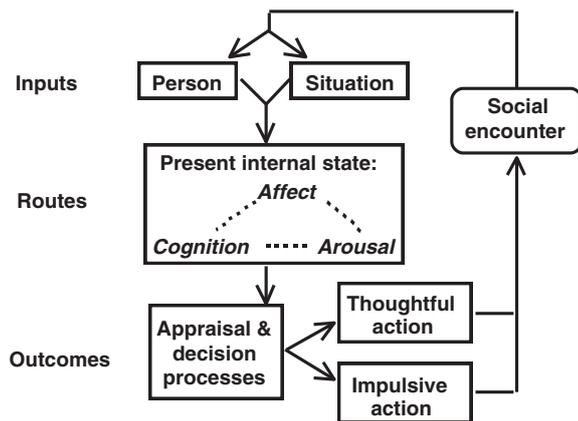
Fig. 1. The General Aggression Model (Anderson & Bushman, 2001).

2002; Fig. 1). According to the model, two types of input variables can influence aggression: personal and situational. Personal variables include anything the individual brings to the situation (e.g., gender, genetic predispositions, personality traits, attitudes, beliefs, values). Situational variables include all external factors that can influence aggression (e.g., violent media, alcohol, unpleasant situations). The present research focuses on one key situational variable—the effects of playing a violent video game. We chose to focus on video games because of their increasing importance in the media landscape.

According to the General Aggression Model, personal and situational factors influence one's internal state, such as aggressive thoughts, angry feelings, and physiological arousal levels. Moreover, these internal states are all interconnected. For example, someone who feels angry might also have elevated blood pressure.

If people have the cognitive resources available, they may use higher-order cognitive processes to further analyze their situation. For example, they might think about how they feel, make causal attributions for what led them to feel this way, and consider the consequences of acting on their feelings. In the present research we focus on one key cognitive process—the *hostile expectation bias* (Dill, Anderson, Anderson, & Deuser, 1997), which is the tendency to expect others to react to potential conflicts with aggression.

The types of decisions and appraisals people can make will no doubt influence whether they behave in a thoughtful, nonaggressive manner or in an impulsive, aggressive manner. We predict that the hostile expectation bias will increase the likelihood of impulsive, aggressive behavior.

The final outcomes then cycle through the "social encounter" to become part of the inputs for the next episode. For example, aggressive behavior can influence relationships with family members and friends, which can also influence the types of situational variables one is exposed to.

Hostile expectation bias

When it comes to human thought and behavior, perception may be more important than reality (e.g., Clarkson, Hirt, Jia, & Alexander, 2010). The way we respond to others is largely determined by how we expect them to respond to us. If we expect others to behave in an aggressive manner, we may be more likely to behave in an aggressive manner ourselves. The bias to expect aggression from others in ambiguous situations that might erupt into aggressive behavior is called the *hostile expectation bias* (Dill et al., 1997). People who have this bias "tend to view the world through blood-red tinted glasses" (Dill et al., 1997, p. 275). Note that the hostile expectation bias differs from the hostile attribution bias. The *hostile attribution bias* is the tendency to perceive ambiguous actions by others as hostile. For example, if a person bumps into you, a hostile attribution would be that

the person did it on purpose to hurt you. If you bump into another person, a hostile expectation would be that the person will assume that you did it on purpose and will attack you in return.

Previous research has shown that playing violent video games can influence the hostile expectation bias (e.g., Bushman & Anderson, 2002). No study, however, has tested the effects of violent video games on both hostile expectations and aggressive behavior. The present study fills this gap in the literature.

Overview

French college students were randomly assigned to play a violent or nonviolent video game for 20 min. Next, they read ambiguous story stems about potential interpersonal conflicts, and indicated what they expected the main characters in the stories to do or say, think, and feel as the story continued. We predicted that violent video game players would show a greater hostile expectation bias than nonviolent game players would. That is, violent game players should be more likely than nonviolent game players to expect the main characters to respond to the ambiguous provocations in the stories in a more aggressive manner. This hostile expectation bias, in turn, was predicted to relate positively to aggression.

Method

Participants

Participants were 136 French college students (50% female; $M_{age} = 21.1$, $SD = 3.7$) who received course credit.

Procedure

Participants were told that the researchers were studying the effects of the video games on perceptual processes. After informed consent was obtained, participants were randomly assigned to play a violent or nonviolent game for 20 min. To increase the generalizability of findings (Wells & Windschitl, 1999), we used three violent games (*Condemned 2*, *Call of Duty 4*, and *The Club*; all rated 18+) and three nonviolent games (*S3K Superbike*, *Dirt 2*, and *Pure*; all rated 10+).

Next, participants completed two ambiguous story stems (see Anderson & Bushman, 2002; Dill et al., 1997). In one story, a driver crashes into the back of the main character's car, causing a lot of damage to both vehicles. After surveying the damage, the main character approaches the other driver. In the other story, the main character wants to go on vacation with her friend, who refuses to go because she is saving money for High Fidelity (hi fi) audio equipment. The main character goes over to her friend's house. Participants are asked: "What happens next? List 20 things that the (main character) will do or say, think, and feel as the story continues."

Next, participants rated how absorbing, action-packed, arousing, boring, difficult, enjoyable, entertaining, exciting, frustrating, fun, involving, stimulating, and violent the video game was (1 = *not at all* to 7 = *extremely*). The violent rating was used as a manipulation check. The other ratings were used as possible covariates to control for differences between video games besides violent content. To control for habitual exposure to violent video games, participants also listed their three favorite games, and we counted the number rated 18+. Because the same pattern of results was obtained with and without the covariates, we used the simpler analyses that excluded the covariates.

Participants were told that they would compete with an opponent (actually a confederate) on a 25-trial computer game in which they had to respond to a visual cue faster than their partner, with the loser receiving a noise blast through a pair of headphones. The intensity and duration of the noise were determined by each individual at the

beginning of each trial, from 60 dB (Level 1) to 105 dB (Level 10; about the same level as a smoke or fire alarm). A nonaggressive no-noise level was also offered (Level 0). Participants could also determine how long their opponent suffered by setting the noise duration from 0 to 5 s, in .5 s noise increments. The participant won 12 of the 25 trials (randomly determined). The ostensible opponent set random noise intensities and durations across the 25 trials. Basically, within the ethical limits of the laboratory, participants controlled a weapon that could be used to blast their opponent with unpleasant noise. The construct validity of this task is well established (Anderson & Bushman, 1997; Bernstein, Richardson, & Hammock, 1987; Giancola & Zeichner, 1995). It has been used for decades as a reliable and valid measure of laboratory aggression (Taylor, 1967). A debriefing followed. None of the participants expressed suspicion about the study.

Results

Preliminary analyses

Exemplars of violent and nonviolent video games

There were no significant differences among the three violent video games, or among the three nonviolent video games, on hostile expectations or aggressive behavior. Thus, the data were collapsed across exemplars of video game types for subsequent analyses.

Manipulation check of violent content of video games

As expected, violent video games were rated as more violent than nonviolent video games, $M = 5.91$ and 2.46, respectively, $F(1,134) = 189.52$, $p < .001$, $d = 2.37$. Thus, the violent game manipulation was successful.

Intercoder reliability

Two independent raters, blind to experimental conditions, tabulated the number of aggressive behaviors, thoughts, and feelings participants listed when completing the story stems. The intraclass correlation coefficients were .74, .78, and .82 for aggressive behaviors, thoughts, and feelings, respectively (Shrout & Fleiss, 1979). Because the intraclass correlation coefficients were relatively high, the scores from the two raters were averaged. To increase reliability, responses from the two story stems were combined.

Primary analyses

Hostile expectations

Data were analyzed using a 3 (dependent measure: aggressive behavior, aggressive thoughts, aggressive feelings) × 2 (video game content: violent, nonviolent) × 2 (participant sex) MANOVA. Video game content and participant sex factors were between-subjects factors, whereas the type of dependent measure was a within-subjects factor.

As expected, participants who played a violent video game expected more aggressive responses from the main characters in the stories than did participants who played a nonviolent video game, $F(3,130) = 29.07$, $p < .0001$, WIlks' $\Lambda = .598$. Men also expected more aggressive responses than women did, $F(3,130) = 19.31$, $p < .0001$, WIlks' $\Lambda = .612$. Type of video game and participant sex also interacted to influence aggressive expectations, $F(3,130) = 7.18$, $p < .0001$, WIlks' $\Lambda = .858$. Violent video game content had a stronger effect on expected aggressive responses in men (see Fig. 2a) than in women (see Fig. 2b). Univariate ANOVAs found that video game content, participant sex, and their interaction had significant effects on each dependent variable separately ($ps < .0001$).

Aggressive behavior

Noise intensity and duration levels across the 25 trials were significantly correlated ($r = .94$ $p < .0001$), and were therefore averaged to form a more reliable measure of aggression. Data were analyzed
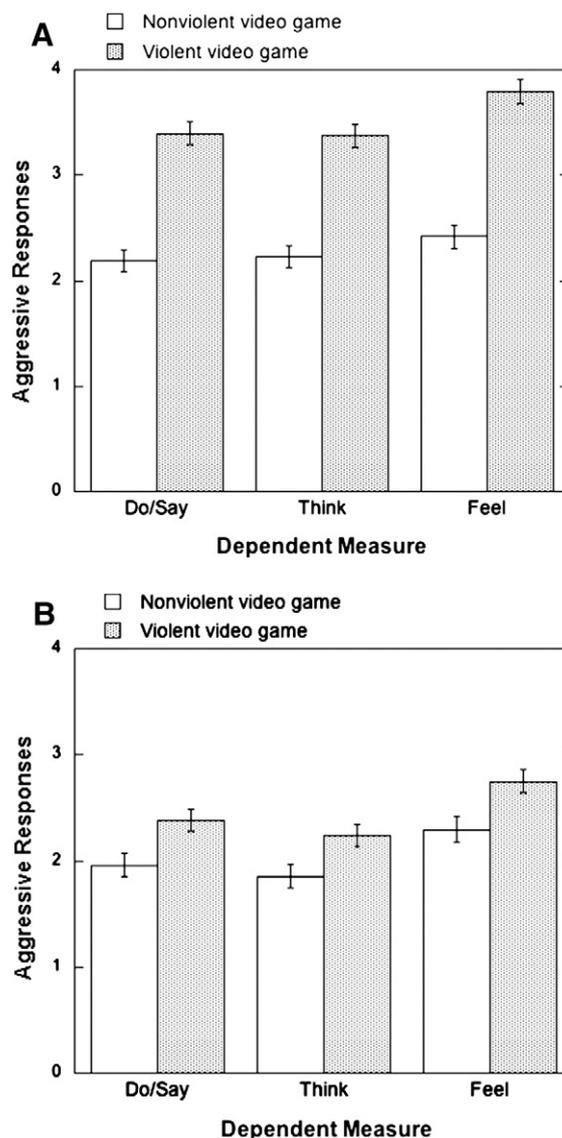

Fig. 2. *A.* Effect of videogame content on expectations of whether the main characters in the stories would do or say something aggressive, have aggressive thoughts, or feel angry inside ($N = 68$ men). Capped vertical bars denote 1 *SE*. *B.* Effect of videogame content on expectations of whether the main characters in the stories would do or say something aggressive, have aggressive thoughts, or feel angry inside ($N = 68$ women). Capped vertical bars denote 1 *SE*.

using a 2 (violent vs. nonviolent game) × 2 (participant sex) between-subjects ANOVA. As expected, violent game players were more aggressive than were nonviolent game players, $Ms = 5.46$ and 4.01, respectively, $F(1,131) = 21.98$, $p < .0001$, $d = .82$. Men also tended to be more aggressive than women, $Ms = 5.03$ and 4.45, respectively, $F(1,131) = 3.55$, $p < .06$, $d = .33$, although the difference was not quite significant. The interaction between video game content and participant sex was nonsignificant, $F(1,131) = .97$, $p > .32$.

Moderated mediation

We tested for moderated mediation (see Muller, Judd, & Yzerbyt, 2005), with violent video game exposure (coded violent = .5, nonviolent = −.5) as the independent variable, participant sex (coded male = .5, female = −.5) as the moderator, hostile expectation bias as the mediator (combination of thoughts, feelings, and behaviors; Cronbach $\alpha = .83$), and aggressive behavior as the dependent variable. Aggressive behavior (Model 1) and hostile expectations (Model 2) were regressed on violent video game exposure, participant sex, and their
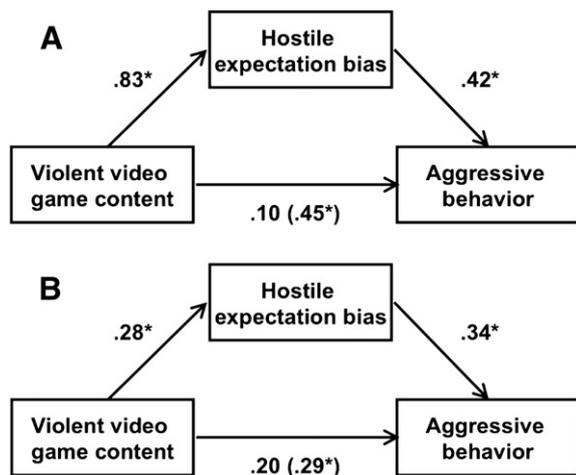
Fig. 3. *A.* Mediating effect of hostile expectations on the link between exposure to video game violence and aggressive behavior for men. The β in parentheses was obtained from a model that included both video game violence and hostile expectations as predictors of aggression. * $p<.05$. *B.* Mediating effect of hostile expectations on the link between exposure to video game violence and aggressive behavior for women. The β in parentheses was obtained from a model that included both video game violence and hostile expectations as predictors of aggression. * $p<.05$.

interaction. In Model 3, aggressive behavior was regressed on the same variables as Model 1, but hostile expectation bias (mean deviated) and its interaction with participant sex were added.

In Model 1, violent game players were more aggressive than nonviolent game players, $\beta = 1.45$, $t(131) = 4.69$, $p<.0001$. Men also were marginally more aggressive than women, $\beta = .58$, $t(131) = 1.89$, $p<.06$. As would be expected for a prototypical moderated mediation analysis (see Muller et al., 2005), there was no video game by participant sex interaction, $\beta = .61$, $t(131) = .98$, $p = .33$.

In Model 2, hostile expectation bias was greater for violent game players than for nonviolent game players, and for men than for women, $\beta = .42$, $t(132) = 3.34$, $p = .0011$ and $\beta = .65$, $t(132) = 7.35$, $p<.0001$, respectively. The interaction between video game content and participant sex was also significant, $\beta = .83$, $t(132) = 4.66$, $p<.0001$.

In Model 3, there was a positive relationship between hostile expectation bias and aggressive behavior, $\beta = 1.09$, $t(129) = 2.78$, $p = .0063$. No other effects were significant.

Overall, this pattern of results shows moderated mediation. The video game effect on aggression was mediated by hostile expectation bias to a greater extent for men (Fig. 3a) than for women (Fig. 3b). This is because video game content influenced the mediator (i.e., hostile expectation bias) more for men than for women (see Figs. 2a and b).

Discussion

Previous research has already shown that violent video games increase hostile expectations (Bushman & Anderson, 2002), and that they also increase aggressive behavior (for a meta-analytic review see Anderson et al., 2010). However, no previous research has tested the effects of violent video games on both hostile expectations and aggressive behavior within the same experiment. This is important because hostile expectations offer a compelling explanation of why violent video games increase aggression.

Consistent with the General Aggression Model (e.g., Anderson & Bushman, 2002), the present research shows that hostile expectations mediate the link between violent video game exposure and aggression. After playing a violent video game, people expect others to behave in an aggressive and hostile manner. These hostile expectations, in turn, increase the likelihood that players will behave in a hostile and aggressive manner themselves. Effects were significant for both men and women, but they were stronger for men. These findings are consistent with research showing that men and women think differently about aggression, and these differing beliefs are important mediators of sex differences in aggressive behaviors. Women perceive negative consequences from aggression more than men do, and these perceptual differences are learned aspects of gender role (Sahoo, 2004).

Abraham Lincoln was right. The media can influence our expectations. The present research shows that playing a violent video game causes a hostile expectation bias. This hostile expectation bias, in turn, increases the likelihood that players will behave aggressively after the game has been turned off.

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