
Violent Video Games and Hostile Expectations: A Test of the General Aggression Model

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Research conducted over several decades has shown that violent media increase aggression. It is now time to move beyond the question of whether violent media increase aggression to answering the question why violent media increase aggression. The present research tested whether violent video games produce a hostile expectation bias—the tendency to expect others to react to potential conflicts with aggression. Participants (N = 224) played either a violent or nonviolent video game. Next, they read ambiguous story stems about potential interpersonal conflicts. They were asked what the main character will do, say, think, and feel as the story continues. People who played a violent video game described the main character as behaving more aggressively, thinking more aggressive thoughts, and feeling more angry than did people who played a nonviolent video game. These results are consistent with the General Aggression Model.

Recent school shootings (e.g., Columbine High) and the September 11, 2001, terrorist attacks on the World Trade Center and the Pentagon have refueled the long-standing debate about the effects of exposure to media violence. Although this debate appears unresolved in the public arena, the scientific literature leaves little doubt about the effects of media violence on aggressive behavior. A cumulative meta-analysis of media violence studies revealed that by 1975 the scientific evidence was sufficient to claim that media violence exposure was positively linked to significant violent behaviors and that even short-term exposure was sufficient to cause increases in aggressive behaviors (Bushman & Anderson, 2001). Since then, the research base for such claims has grown considerably stronger (Bushman & Anderson, 2001). Unfortunately, during this same time span news reports on the link between media violence and aggression have moved in the opposite direction (Bushman & Anderson, 2001).

Research on media violence has consistently yielded links to aggressive behavior in three types of studies (Anderson & Bushman, 2002a; Bushman & Huesmann, 2001). Experimental studies in lab and field settings have shown that the effects are causal. Cross-sectional correlational studies have shown that exposure to media violence is linked to a wide array of aggressive and violent behaviors. Longitudinal studies have linked early repeated violent television exposure to later aggressive and criminal behavior. The U.S. Surgeon General (Surgeon General's Scientific Advisory Committee on Television and Social Behavior, 1972) and six national health organizations¹ have publicly proclaimed that the issues of whether exposure to violent media causes increased aggression and warrants public concern have been resolved by the research literature with a resounding "yes."

The most recent type of media violence to come under the research microscope is the violent video game. Despite the recency of this genre and the relatively small size of the research literature, there is sufficient research to conclude that violent video game exposure can cause increases in aggressive behavior and that repeated exposure to violent video games is linked to serious forms of aggression and violence (Anderson & Bushman, 2001; Anderson & Dill, 2000).

Considerably less research has addressed the psychological mechanisms through which exposure to violent

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media produces both its short- and long-term effects on aggressive behavior. We have been working on a General Aggression Model designed to provide a useful theoretical framework for integrating recent advances in aggression theory and research with earlier models. The current version of the model (Anderson & Bushman, 2002b; Anderson & Huesmann, in press) is based on several earlier models of human aggression (e.g., Anderson, Deuser, & DeNeve, 1995; Anderson & Dill, 2000; Bandura, 1973, 1983; Berkowitz, 1990, 1993; Crick & Dodge, 1994; Geen, 2001; Huesmann, 1986, 1998; Lindsay & Anderson, 2000; Zillmann, 1983). It provides a useful framework for understanding violent media effects and guided the design of the present research on the priming effect of violent video games on hostile biases.

According to this model, aggression is largely based on the activation and application of aggression-related knowledge structures stored in memory (e.g., scripts, schemas). Of particular relevance to this article is the finding from several research groups that aggressive people tend to interpret ambiguous social events in a relatively hostile way. The most widely researched version of this phenomenon is the hostile attribution bias frequently observed in aggressive children (e.g., Crick & Dodge, 1994). The hostile attribution bias is the tendency to perceive harmful actions by others as intentional rather than accidental. Similar hostile perception and hostile expectation biases have been observed in aggressive college students (Dill, Anderson, Anderson, & Deuser, 1997). The hostile perception bias is the tendency to perceive social interactions as being aggressive. The hostile expectation bias is the tendency to expect others to react to potential conflicts with aggression. The key question addressed in the present study is whether a short-term experimental manipulation—exposure to violent video games—can temporarily produce a hostile expectation bias similar to that observed among highly aggressive individuals. If so, it becomes reasonable to suggest that repeated exposure to violent media contributes to the development of an aggressive personality by making such hostile expectations chronically accessible.

THE GENERAL AGGRESSION MODEL

Figure 1 displays a simplified version of the single episode portion of the General Aggression Model. It suggests that recent exposure to violent media can cause short-term increases in aggression through its impact on a person's present internal state, represented by cognitive, affective, and arousal variables. Playing a violent video game may prime aggressive cognitions (including aggressive scripts and aggressive perceptual schemata), increase arousal, and create an aggressive affective (e.g., angry) state.

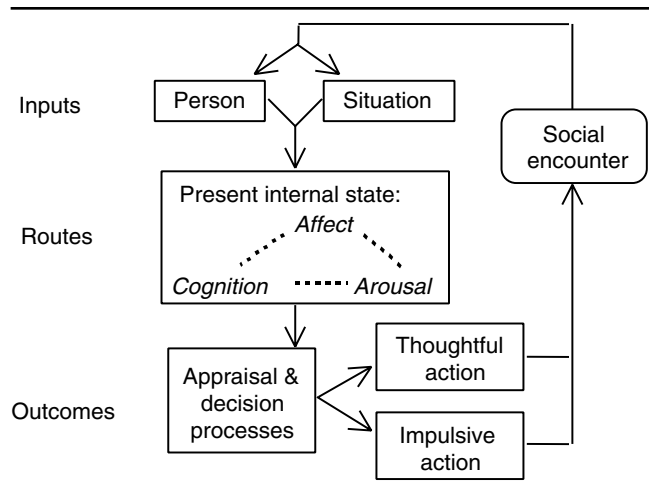


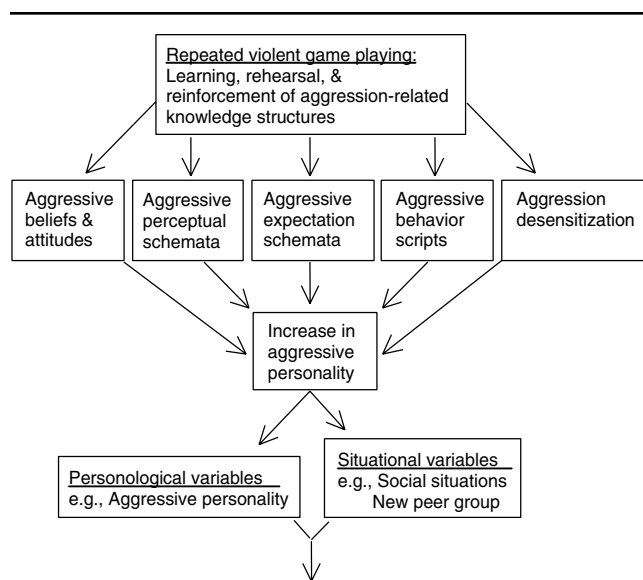
Figure 1 Single episode general aggression model.

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The General Aggression Model also specifies that social knowledge structures develop over time via learning processes, such as learning how to perceive, interpret, judge, and respond to events in the physical and social environment. Each violent media episode, as outlined in Figure 1, is essentially one more trial to learn that the world is a dangerous place, that aggression is an appropriate way to deal with conflict and anger, and that aggression works. With repeated exposure, such hostile knowledge structures become more complex, differentiated, and difficult to change. In this way, repeated exposure to violence can make hostile knowledge structures chronically accessible, essentially creating an aggressive personality. Figure 2 illustrates this process and identifies five types of relevant knowledge structures. Figure 2 also shows that short-term effects of violent media on aggressive cognition are especially important. Four of the five types of variables identified as contributing to the long-term increase in aggressive personality involve aggressive cognitions.

THE PRESENT STUDY

The present study was designed to see whether a brief exposure to media violence, in the form of video games, can temporarily create hostile expectation biases. Prior work has linked individual differences in hostile biases to aggressive behavior, as outlined earlier. Recent work has shown that brief exposure to violent video games (a situational input in Figure 1) can automatically prime aggressive thoughts (present internal state). For example, Anderson and Dill (2000) randomly assigned young adults to play a violent or a nonviolent video game and



General Aggression Model, as in Figure 1

Figure 2 Multiple episode general aggression model: Long-term effects of video game violence.

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then measured the time it took them to recognize and begin pronouncing aggressive words. The results showed that aggressive thoughts were significantly more accessible to those who had just finished playing a violent video game.

The General Aggression Model further predicts that such brief exposure can temporarily create a hostile expectation bias at the “Outcomes” level of processing, as shown in Figure 1. To test that prediction, we randomly assigned college student participants to play one of four violent or four nonviolent video games for a brief period of time. Afterward, they were given ambiguous story stems about potential interpersonal conflicts. They were asked what the main character will do, say, think, and feel as the story continues. We expected that people who played a violent video game would describe the main character as behaving more aggressively, thinking more aggressive thoughts, and feeling more aggressive than would people who played a nonviolent video game.

METHOD

Participants

Participants were 224 undergraduate students (112 men and 112 women) enrolled in introductory psychology courses. Students received course credit in exchange for their voluntary participation.

Procedure

Participants were tested individually. They were told that they would complete a number of different tasks that would help the researchers select stimuli for future studies. After giving their consent, participants were randomly assigned to play either a violent or a nonviolent video game for 20 mins. We used four violent video games (*Carmageddon*, *Duke Nukem*, *Mortal Kombat*, *Future Cop*) and four nonviolent video games (*Glider Pro*, *3D Pinball*, *Austin Powers*, *Tetra Madness*) to make the findings more generalizable (Wells & Windschitl, 1999).

Next, participants completed three ambiguous story stems (see the appendix). These story stems have been successfully used in previous research (Dill et al., 1997; Rule, Taylor, & Dobbs, 1987). Each story stem ended with the question “What happens next?” Participants indicate what the main character will do or say, think, and feel as the story continues. Three separate columns are provided for participants to list what the main character will do or say, think, and feel. Participants were asked to list a total of 20 unique possibilities. A full debriefing (with probe for suspicion) followed. None of the participants reported a suspicion that the study was about effects of video game violence on aggressive content in the story completion task.

RESULTS

Stimulus Sampling

For each type of video game (i.e., violent, nonviolent), we tested whether the four different games produced different effects on the three dependent variables (i.e., expectations about the main character’s aggressive behaviors, thoughts, and feelings in the three stories). No significant differences were found between the four different violent video games (i.e., *Carmageddon*, *Duke Nukem*, *Mortal Kombat*, *Future Cop*) on any of the dependent variables, for either men or women, $F_s < 1$, $p_s > .5$. Similarly, no significant differences were found between the four different nonviolent video games (i.e., *Glider Pro*, *3D Pinball*, *Austin Powers*, *Tetra Madness*) on any of the dependent variables, for either men or women, $F_s < 1$, $p_s > .5$. The random-effects variance estimates for video game exemplar were also quite small, ranging from 0.000 to 0.032 ($M = 0.0053$). None of the random-effects variance estimates significantly differed from zero, $p_s > .05$. Thus, we combined the four violent video game exemplars and we combined the four nonviolent video game exemplars for subsequent fixed-effects analyses.

Reliability of Dependent Measures

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 .87, .74, and .85 for aggressive behaviors, thoughts, and feelings, respectively (Shrout & Fleiss, 1979). Because the intraclass correlation coefficients were high, the scores from the two raters were averaged.

Dependent Measures

To complete the story stems, participants listed what they thought the main character would do or say, think, and feel next. To increase reliability, responses from the three story stems were combined in the analyses. The alpha coefficients were .86, .88, and .87 for aggressive behaviors, thoughts, and feelings, respectively. These alpha coefficients are very high, especially because there were only three story stems for each dependent measure.

Statistical Assumptions

The distributions for the three dependent variables were each positively skewed and the variances in the violent and nonviolent video game conditions were not equal. A square root transformation successfully reduced the skewness and stabilized the variances. Skewness was reduced from 9.4 to 3.5 for aggressive behaviors, from 10.5 to 4.9 for aggressive thoughts, and from 10.5 to 4.7 for aggressive feelings. The ratio of variances in the violent and nonviolent video game conditions was reduced from 31.4 to 2.7 for aggressive behaviors, from 75.3 to 4.1 for aggressive thoughts, and from 28.2 to 3.9 for aggressive feelings. Although the transformed data were used in all analyses, the transformed means were transformed back to the original scale for all figures and reported means for ease of exposition.

Main Analyses

Multivariate analysis of variance was used to determine whether the type of video game and participant sex influenced expectations about how the main character would respond in the situation. A 2 (video game: violent, nonviolent) \times 2 (participant sex: men vs. women) \times 3 (dependent measure: aggressive behavior, aggressive thoughts, aggressive feelings) factorial design was used. The video game and participant sex factors were between-subjects, whereas the type of dependent measure was within-subjects.

As expected, people who played violent video games expected more aggressive responses from the main characters in the stories than did people who played the nonviolent video games, $F(1, 220) = 7.40, p < .007$ (see Figure 3). People who played a violent video game were more likely to expect the main characters to say or do something aggressive, $F(1, 220) = 8.14, p < .005, d = 0.38$. For example, one person who played a violent video game

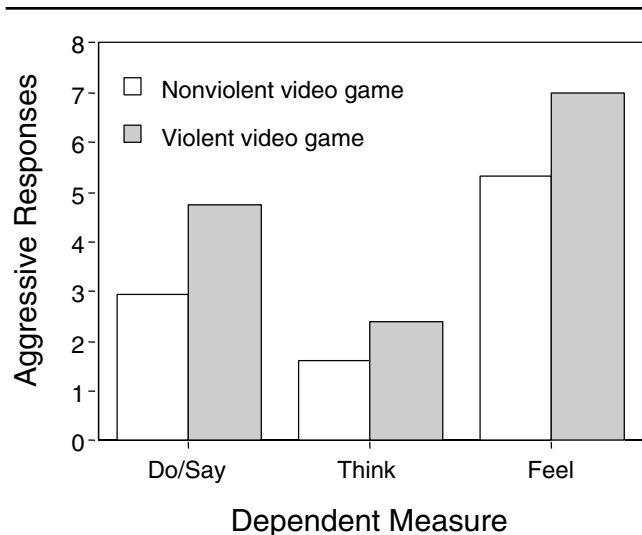


Figure 3 Number of aggressive responses for each dependent measure as a function of type of video game.

expected the main character in the “car accident” story to “shoot or stab the other driver.” People who played a violent video game were more likely to expect the main characters to have aggressive thoughts and ideas, although the effect was not quite significant, $F(1, 220) = 3.69, p < .06, d = 0.26$. For example, one person who played a violent video game expected the main character in the “going to a restaurant” story to think about “setting the table cloth on fire.” People who played a violent video game also were more likely to expect the main characters to feel angry and aggressive, $F(1, 220) = 6.17, p < .02, d = 0.33$. For example, one person who played a violent video game expected the main character in the “persuading a friend” story to feel “very pissed off.” The appendix contains some other aggressive comments made by people who played the violent video game. These aggressive comments were made by many participants, not just a few select individuals. For each scenario, there is only one comment per person per dependent measure.

The magnitude of the video game effect did not depend on the sex of participants or on the type of dependent measure. The Video Game \times Sex, Video Game \times Dependent Measure, and Video Game \times Sex \times Dependent Measure interactions were all nonsignificant, $F(2, 220) = 0.12, p > .7, F(2, 219) = 1.32, p > .2, F(2, 219) = 0.18, p > .8$.

Other effects, less central to the main hypotheses being tested, also were found. There was a significant main effect of type of dependent measure, $F(2, 219) = 187.51, p < .0001$. As can be seen in Figure 3, aggressive feelings were listed most frequently, followed respectively by aggressive behaviors and aggressive thoughts, $M_s = 6.14, 3.79, \text{ and } 2.00$. There also was a significant

interaction between participant sex and type of dependent measure, $F(2, 219) = 4.98, p < .008$. Men expected the main characters to behave more aggressively than did women, $M_s = 4.50$ and $3.13, F(1, 220) = 4.79, p < .03, d = 0.30$. Men and women did not differ in their expectations of what the main characters would think or feel, $M_s = 2.19$ and $1.83, F(1, 220) = 0.78, p > 0.3, d = 0.12$, and $M_s = 6.03$ and $6.25, F(1, 220) = 0.09, p > .7, d = -0.04$, respectively. The main effect for participant sex, however, was nonsignificant, $F(1, 220) = 1.23, p > .2$.

Supplemental Analyses

One common problem with experimental research on media violence concerns potential differences between the specific violent and nonviolent stimuli on theoretically irrelevant dimensions. When only one violent and one nonviolent exemplar are used, there is the possibility that some idiosyncratic difference between the stimuli other than their difference in violent content might have created the observed results. This problem is not unique to media violence research, of course (Clark, 1973; Wells & Windschitl, 1999).

We used four violent and four nonviolent games to reduce this potential problem. If idiosyncratic differences within each type of game (violent and nonviolent) were influencing responses on our measures, then we should see these differences in the results. As noted earlier, the random effects analyses revealed strong evidence against any claim that our results were due to idiosyncratic characteristics of the eight games used. In other words, we are in a much stronger position to generalize our results to other violent and nonviolent games than is true in the typical experimental study that uses one exemplar of each independent variable level.

Another way to address the generalizability question concerns the extent to which the violent content of the games is uniquely associated with the aggressive responses. In another experimental study, we had 319 participants play one of these same eight games and rate how enjoyable, boring, and violent they thought the game was. We used the mean ratings for each game as covariates in three multivariate analyses of covariance on the aggressive responses of participants in the present study. The results for the enjoyable and boring analyses were essentially the same as the main analyses reported earlier. Participants who played violent video games generated significantly more aggressive responses than did participants who played the nonviolent video games, $F_s(1, 219) > 5.80, p_s < .02$. The same pattern of means, the same main effect of type of measure, and the same Dependent Measure \times Sex interactions also were significant and were very similar to the results reported earlier.

Furthermore, when the violence ratings were used as a covariate, the effect of type of video game (violent vs.

nonviolent) on aggressive responses disappeared, $F(1, 219) = 0.26, p > .60$. This is exactly what one would expect if violent content is what distinguished the violent and nonviolent video games used in the present research. If violent ratings are used in place of type of type video game, the results are the same as those reported in the main analyses section. The more violent the video game was rated to be, the more people expected the main characters to behave aggressively, have aggressive thoughts and ideas, and feel angry and aggressive, $F(1, 220) = 9.19, p < .005, r = .20, F(1, 220) = 4.42, p < .05, r = 0.14$, and $F(1, 220) = 7.19, p < .01, r = 0.18$, respectively.

DISCUSSION

Summary and Implications

As predicted by the General Aggression Model, playing a violent video game for just 20 mins produced significant increases in expectations that potential conflict situations would be handled aggressively. Violent video game participants expected more aggressive thoughts, feelings, and behaviors from the main characters in the stories. This occurred even though participants were not provoked or annoyed in any way.

Only one published study has tested the hypothesis that brief exposure to violent video games can increase aggressive expectations. Kirsh (1998) randomly assigned third- and fourth-grade children to play either a violent video game (*Mortal Kombat*) or a nonviolent game (*NBA Jam*). They then listened to five ambiguous provocation stories. In each, they were told to imagine that they were the story character to whom a negative event happened, apparently caused by a same-sex peer. They then answered six questions about each story. Three of the questions assessed future expectations—about their next action, punishment of the perpetrator, and emotional reaction of the perpetrator. Only the first of these three expectation questions yielded a statistically reliable result. Children who had just played *Mortal Kombat* expected to behave more aggressively than those who had played *NBA Jam*.²

In addition to providing further support of predictions based on the General Aggression Model, the present experiment goes beyond Kirsh's experiment in several ways. First, we assessed three types of expectations—thoughts, feelings, and behaviors—and found increases in the aggressive content of all three. Second, we assessed expectations about how people in general would react rather than hypothetical self-expectations. Third, we used a different participant population (adult) and a very different set of ambiguous hypothetical stories. Fourth, by using four different games of each type, the present study more clearly pinpoints the key factor producing these shifts in aggressive expectations

as the violent content of the games. Finally, the fact that controlling for the rated enjoyability and boringness of the games did not eliminate the violent game effect, whereas controlling for rated violence did eliminate the effect, further supports the hypothesis that violent content in video games can temporarily create a hostile expectation bias. In sum, the present study supports the General Aggression Model-based prediction that exposure to violent media can influence the amount of aggressive expectations that people conjure up in response to potential conflict situations.

Future Directions

There are many theoretical, empirical, and public policy issues involving violent video games, media violence in general, and the General Aggression Model in need of additional research. For example, are the various hostile biases that have been identified by various research groups closely related to each other? Do such biases increase social conflicts? Do they play a mediation role in long-term effects of media violence on aggressive and violent behaviors? Are there effective interventions that can be used by parents, schools, and counselors to reduce or eliminate hostile biases? Research shows that reducing exposure to violent media (e.g., Robinson, Wilde, Navracruz, Haydel, & Varady, 2001) and that changing children's attitudes about and understanding of media violence (e.g., Huesmann, 1983) significantly reduces aggression. Are such approaches effective because they reduce hostility biases or because of some other mechanism? The General Aggression Model organizes the relevant research in a simple way and can serve as a guide for future research designed to answer these crucial questions.

APPENDIX

THE CAR ACCIDENT

Todd was on his way home from work one evening when he had to brake quickly for a yellow light. The person in the car behind him must have thought Todd was going to run the light because he crashed into the back of Todd's car, causing a lot of damage to both vehicles. Fortunately, there were no injuries. Todd got out of his car and surveyed the damage. He then walked over to the other car.

What happens next? List 20 things that Todd will do or say, think, and feel as the story continues.

Some aggressive responses from people who played a violent video game are as follows:

Do/Say

- Say "shit," then call the guy an "idiot."
- "What the hell were you thinking?"
- Kick the other driver's car.

- Kick the other guy's butt.
- "Think!!!! You're paying for this!"
- "Are you smokin' crack?"
- Todd starts throwing punches.
- Start yelling and swearing at the guy.
- "Are you blind?"
- "What the hell is wrong with you?"
- "I can't believe you have a license."
- Kick out a window.
- Beat his head in.
- Todd shot or stabbed the other driver.

Think:

- "This guy's dead meat!"
- "This guy is dead."
- "I'm gonna kill him."
- "What a dumbass!"
- "What an asshole!"
- "Where did this idiot learn how to drive?"
- "What the hell?"
- "That bastard!"
- "I really want to punch this driver's lights out!"
- "Stupid! Idiot! Moron!"
- "I should drive a knife through your eye!"
- "If I had a hammer I'd beat him with it!"

Feel:

- Irritated
- Furious
- Vicious
- Cruel
- Pissed off!
- Ready to hit him!
- Aggressive
- Hate for that guy
- Angry
- Violent
- Like kicking the guy's ass who hit him.
- Angry because he *didn't* get hurt!

PERSUADING A FRIEND

Janet had worked all summer long, and now, a couple of weeks before school started, she felt she deserved a holiday. After a bit of thought, she decided on a vacation to the coast would be ideal. After all, what could be better than sun tanning and swimming in the ocean? The problem was that she did not want to go alone. She knew her best friend Shannon would go if she could but Shannon had been saving her money to buy a new stereo. Janet decided to go over to Shannon's place and try to convince her to come to the coast.

What happens next? List 20 things that Janet will do or say, think, and feel as the story continues.

Some aggressive responses from people who played a violent video game are as follows:

Do/Say:

- Janet takes Shannon's boyfriend.
- "You don't want to go? Fuck you then bitch!"

- “I’ll just go ask Jen to go with me instead.”
- “Don’t wimp out on me!”
- Speak to her with contempt if she disagrees.
- Tell her how dumb the stereo is.
- Yell at Shannon for thinking of herself.
- Give her guilt trips.
- They get into a fist fight.
- “Fine. Just sit here in your hole and rot!”
- They start arguing and decide not to be friends anymore.
- Janet gets into her car, puts the car in drive, and rolls through Shannon’s house.

Think:

- “She’s so dumb.”
- “Maybe I should threaten her.”
- “Who needs her, anyway.”
- “She’s not gonna go. I hate her!”
- “She better see it my way.”
- Janet thinks Shannon is a loser.
- “Why was I ever friends with her?”
- “What else can I do to piss her off?”
- “She better say yes.”
- “What’s her problem?”
- “She shouldn’t be such a stick in the mud.”
- “She need to quit being so ‘tight.” ”

Feel:

- Mad
- Betrayed
- Furious
- Vicious
- Angry
- Annoyed
- Bitter
- Irritated
- Cruel
- Aggressive
- Cranky
- Very pissed off

GOING TO A RESTAURANT

Jane had worked hard all day long cleaning her apartment. She was tired but decided to reward herself with a meal in one of the restaurants down the street. Upon entering the restaurant, Jane decided upon a Caesar salad, French onion soup, and filet mignon. Some 15 minutes later, a waiter came around to take her order. Time slowly passed and Jane was getting hungrier and hungrier. Finally, about 45 minutes after her order had been taken, Jane was about to leave when she saw the waiter approaching with her food.

What happens next? List 20 things that Jane will do or say, think, and feel as the story continues.

Some aggressive responses from people who played a violent video game are as follows:

Do/Say:

- Eat and refuse to pay.
- Punch the waiter.

- “I hope this isn’t your real job!”
- “What did you have to do, butcher a cow?”
- Steal the silverware.
- “Keep the food. I’m gone!”
- Dump the food on the waiter’s head.
- Swear at the manager.
- “I wish I had him as my waiter” (points to another waiter)!
- “Did you have to go to France to get the French onion?”
- I was contemplating whether this floral centerpiece was edible.
- She calls the restaurant and orders four steaks to pick up by a different name.

Think:

- “Damn this service is shitty.”
- Hit the waiter.
- “This guy needs to be fired.”
- “WHAT IDIOTS!!!”
- “I hate this waiter!”
- “This place sucks!”
- “No tip here.”
- “They better not charge me for this food.”
- “What took so damn long?”
- “I should set this table cloth on fire!”
- “I’m going to tell everyone how lousy it is here.”
- “I should write to the newspaper about this place.”

Feel:

- Mad
- Hostile
- Offended
- Irritated
- Pissed off
- Cranky
- Frustrated with the service
- Angry
- Cruel
- Cranky
- Pushed to the limit
- Bitchy

NOTES

1. Joint Statement on the Impact of Entertainment Violence on Children, Congressional Public Health Summit, July 26, 2000. Signed by the American Academy of Pediatrics, American Psychological Association, American Academy of Child & Adolescent Psychiatry, American Medical Association, American Academy of Family Physicians, and American Psychiatric Association.

2. Two of the other three questions—one involving the perpetrator’s intent, the other involving the perpetrator’s liking for the victim—also yielded the predicted significant violent versus nonviolent game effects.

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