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General Aggression Model

BRAD J. BUSHMAN
The Ohio State University, USA

CRAIG A. ANDERSON
Iowa State University, USA

The general aggression model (GAM; Anderson & Bushman, 2002) provides a useful theoretical framework for understanding violent media effects (Anderson & Bushman, 2018), although, as the word "general" implies, it can explain many other effects besides violent media effects, such as the effects of alcohol or hot temperatures on aggression. The primary effects of interest to most people are aggression and violence. This entry begins by defining the terms aggression, violence, and violent media. Next, it describes the GAM and, finally, it describes empirical support for the GAM using results from studies on violent media effects.

Defining aggression, violence, and violent media

It is useful to begin with definitions of aggression and violence, especially because lay people and researchers sometimes define these terms differently. Most researchers define *aggression* as any behavior intended to harm another person who wants to avoid being harmed (Baron & Richardson, 1994). The harm can by psychological or physical. Most researchers define *violence* as any behavior intended to cause extreme physical harm to another person who does not want to be harmed, such as injury or death (Bushman & Huesmann, 2010). Thus, all violent acts are aggressive, but not all aggressive acts are violent—only acts intended to cause extreme physical harm are classified as violent.

The definition of violence can also be applied to *media violence*, which is any behavior intended to cause extreme physical harm to a media character who does not want to be harmed (Bushman, 2017). Media characters can take various forms (e.g., actual people, animals, realistic characters, fictitious characters, cartoon characters). This definition of media violence is very similar to definitions used to analyze violent content in various forms of media. For example, several previous content analyses of films have defined *violence* as "Physical acts where the aggressor makes or attempts to make some physical contact with the intention of causing injury or death" (e.g., Bushman, Jamieson, Weitz, & Romer, 2013; Sargent et al., 2002). Likewise, the National Television Violence Study (1996, 1997, 1998) defined *media violence* as "any overt depiction of a credible threat of physical force or the actual use of such force intended to physically harm an animate being or group of beings." Note that this definition does not require blood,

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gore, expressions of pain, or other features that are characteristic of real violence. In other words, cute cartoonish characters killing or injuring other characters accompanied by happy music and laughter are considered forms of media violence. Similarly, most child-oriented video games are replete with violence.

General aggression model

The GAM is a metatheory that subsumes other models that have been used to explain the violent media effects (e.g., social learning theory, social cognitive theory, script theory, priming theory, cognitive neoassociation theory, excitation transfer theory). The GAM is depicted in Figure 1. In the GAM, two types of input variables can influence aggression: (i) personal variables, and (ii) situational variables. Personal variables include all individual differences that the person brings with them to the current situation (e.g., gender, age, race, IQ, genetic predispositions, hormones, personality traits, attitudes, beliefs, values, moods). Situational variables include all external or environmental variables outside the individual (e.g., violent media exposure, weapons, provocation, frustration, alcohol, drugs, poverty, hot temperatures, crowding, aggressive peers).

According to the GAM, personal and situational factors influence one's internal state, which include affect, cognition, and arousal. Thus, there are three possible routes to aggression—through aggressive cognition, aggressive affect, and physiological arousal (e.g., skin conductance, heart rate, blood pressure, cardiac coherence, respiration rate). However, these routes are not mutually exclusive or even independent, as indicated

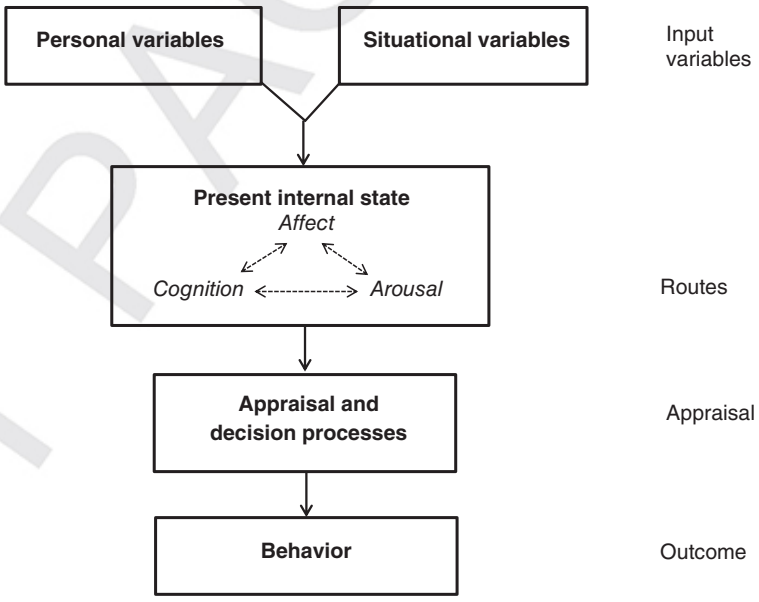

Figure 1 The general aggression model (GAM).
Source: Anderson and Bushman (2002), Krahé (2013).

by the dashed lines with double-headed arrows in Figure 1. For example, someone who has aggressive ideas might also feel angry and have elevated blood pressure. Theoretically, someone who has aggressive thoughts, who feels angry inside, and who is physiologically aroused or stressed out should be more likely to behave in an aggressive manner than someone who does not have aggressive thoughts, who does not feel angry, and who is not physiologically aroused or stressed out.

According to the GAM, internal states influence appraisal and decision processes. Research has shown that at least three hostile biases can influence appraisal and decision processes: (i) hostile attribution bias, (ii) hostile perception bias, and (iii) hostile expectation bias (Dill, Anderson, Anderson, & Deuser, 1997). The *hostile attribution bias* is the tendency to perceive ambiguous actions by others as aggressive. For example, if someone bumps into you, a hostile attribution would be that the person did it intentionally to harm you. The *hostile perception bias* is the tendency to perceive ambiguous social interactions as being aggressive. For example, if you see two people having a conversation, a hostile perception would be that they are arguing or fighting. The *hostile expectation bias* is the tendency to assume that people will react to potential conflicts with aggression. For example, if you bump into another person, a hostile expectation would be that the person will assume that you did it intentionally and will attack you in response.

The types of appraisals and decisions that people make influence their behavior. The GAM was developed to explain and predict aggressive behavior, but it has also been expanded to explain and predict violent behavior (DeWall, Anderson, & Bushman, 2011).

Using the GAM to explain violent media effects

Research shows that exposure to violent media can increase aggression through all three routes in the GAM (i.e., cognition, affect, arousal). For example, meta-analyses have found that exposure to violent video games increases aggressive thoughts, angry feelings, and physiological arousal (e.g., Anderson & Bushman, 2001; Anderson et al., 2010). A meta-analysis is a quantitative literature review that integrates the findings from many studies conducted on the same topic. Another meta-analysis found that exposure to violent media increases hostile appraisals (Bushman, 2016). These meta-analyses that used the GAM as a theoretical basis shed light on why several meta-analyses have found that exposure to violent media increases aggression (Anderson & Bushman, 2001; Anderson et al., 2010; Greitemeyer & Mügge, 2014; Paik & Comstock, 1994; Sherry, 2001) and also violence (Paik & Comstock, 1994; Savage & Yancey, 2008).

An example study is given for each outcome measure reported in these meta-analyses—aggressive thoughts, angry feelings, physiological arousal, hostile appraisals, and aggressive behavior—and for different types of research designs. In experimental designs, the researcher manipulates exposure to violent media and randomly assigns participants to conditions (e.g., violent vs. nonviolent video game). This type of design allows the researcher to make strong cause-effect inferences.

In a cross-sectional design, the researcher measures exposure to violent media and aggressive behavior (as well as possible confounding variables). This type of design allows the researcher to examine more realistic and serious forms of aggression. In a longitudinal design, the researcher also measures exposure to violent media and aggressive behavior, but in the same participants on repeated occasions (e.g., ~~over~~ 6 months for 2 years). This type of design allows the researcher to examine the cumulative and long-term effects of exposure to violent media on aggression. When the evidence converges across different types of designs, it is called *triangulation*, which refers to the use of "multiple reference points to locate an object's exact position" (Jick, 1979, p. 602).

Aggressive thoughts

One series of experiments measured the effect of violent games on the accessibility of aggressive thoughts in memory (Anderson et al., 2004). Participants were first randomly assigned to play a violent or nonviolent video game. After game play, the accessibility of aggressive thoughts in memory was assessed using a word fragment task. Participants were asked to fill in missing letters in word fragments to form actual words. For example, the word fragment KI_ _ can be completed to form an aggressive word (e.g., KILL) or a nonaggressive word (e.g., ~~KISS).~~ As expected, participants who played a violent game listed more aggressive words than participants who played a nonviolent game.

Cross-sectional studies also have demonstrated a link between violent video games and aggressive thinking. For example, in a large sample of young adults ($N = 806$), one study found that those who played a lot of violent video games reported higher levels of hostile thinking and more positive beliefs about aggressive behavior than those who didn't play a lot of violent games (Anderson et al., 2004).

Longitudinal studies also have shown that frequently playing a lot of violent videos at one point in time affects aggressive thinking later in life. For example, in a 3-year study of over 3000 Singaporean children from 8 to 17 years old (Gentile, Li, Khoo, Prot, & Anderson, 2014), researchers assessed video game habits and three types of aggressive thinking: (i) beliefs about aggression; (ii) fantasizing about aggression, and (iii) hostile attribution bias, three times across the 3 years of the study. Amount of exposure to violent video games at the first assessment was positively linked to aggressive thinking a year later, even after controlling for aggressive thinking at the earlier time period. In other words, amount of aggressive thinking increased over time for those who play a lot of violent video games, relative to those who do not play a lot of violent games.

Angry feelings

One experiment measured the impact of violent video games on angry feelings, while also manipulating the size of the screen and whether the images on the large screen were in 2D or 3D (Lull & Bushman, 2016). Participants first played the video game *Grand Theft Auto IV* for 15 minutes in either a violent manner (i.e., kill as many people as they could) or in a nonviolent manner (i.e., get highest score they could while bowling in a bowling alley). The game was played on a desktop computer with a 17-inch (43-cm) 2D screen, or on a large geowall 96-inch (244-cm) screen, either in 2D or in 3D (with

glasses). After game play, participants reported how they felt right then using a number of adjectives, including some that measured angry feelings (e.g., *angry*, *annoyed*, *irritated*). The results showed that participants who played the game in a violent manner felt angrier than those who played in nonviolent manner. The effects were largest when the game was played on a large screen in 3D.

In a cross-sectional study of high school students (Anderson, Gentile, & Buckley, 2007), researchers found that exposure to violent video games was positively associated with a trait measure anger. This was true for both boys and girls. In other words, high school students who play a lot of violent video games also report being angry more often than do those who don't play such games.

There is less evidence concerning the long-term effects of violent video game play on angry feelings. Nonetheless, the overall picture from the most comprehensive meta-analysis found a weak but statistically significant effect (Anderson et al., 2010). That is, frequent exposure to violent video games at an early time period predicted greater increases in aggressive affect over time, relative to low or no exposure to violent video games.

Physiological arousal

In one experiment (Hasan, Bègue, & Bushman, 2013), participants played a violent or nonviolent video game for 20 minutes. Cardiac coherence was measured at baseline and during game play using a sensor placed on their earlobe, which freed up their hands and arms to play the game. Cardiac coherence is a rhythmic or coherent heart rate variability associated with low levels of stress and high levels of relaxation. There was no difference in cardiac coherence at baseline, which suggests that random assignment of participants to video game conditions was successful. During game play, cardiac coherence was significantly lower for violent game players than for nonviolent game players. Thus, violent game players were more stressed out and less relaxed than nonviolent game players.

Hostile appraisals

In one experiment on the hostile expectation bias (Bushman & Anderson, 2002), participants first played a violent or nonviolent video game for 20 minutes. After game play, participants read and completed three story stems, including "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." Independent coders then rated whether responses were aggressive or not. Results showed that 70% of responses listed by violent game players were aggressive, compared to 48% for nonviolent game players. Here are some sample responses of what violent game players thought Todd would do when he walked over to the other car:

"Todd kicks out a window."
"Todd kicks the other guy's butt."
"Todd starts throwing punches."
"Todd beat his head in."
"Todd shot or stabbed the other driver."

This study was also replicated in France (Hasan, Bègue, & Bushman, 2012), and similar results were obtained (although nobody in France said that Todd shot or stabbed the other driver!).

There are a number of high-quality cross-sectional and longitudinal studies of the link between violent video game play and hostile appraisals. For example, in a study of German adolescents, researchers found that playing lots of violent video games at one point in time led to an increase in hostile attribution bias when it was measured 30 months later (Möller & Krahé, 2009).

Aggressive behavior

The most frequently studied outcome variable is, of course, aggressive behavior. In one experiment (Konijn, Nije Bijvank, & Bushman, 2007), Dutch boys about 14 years old were randomly assigned to play a violent or nonviolent video game for 20 minutes and rated how much they identified with the video game character. Next, they completed a noise blast task, with the winner blasting the loser with a noise through headphones ranging from about 60 decibels to about 105—about the same level as a fire alarm. The boys were told that inflicting higher noise levels could cause "permanent hearing damage" to their partners (of course, nobody actually got hearing damage). The results showed that violent game players were more aggressive than nonviolent game players, especially if they identified with the violent game character. These boys were even willing to give another boy noise levels loud enough to cause permanent hearing damage. One boy said, "I blasted him with level 10 noise because he deserved it. I know he can get hearing damage, but I don't care!" Another boy said he liked the violent game "because in this game you can kill people and shoot people, and I want to do that too." A third boy said, "I like Grand Theft Auto a lot because you can shoot at people and drive fast in cars. When I am older I can do such things too. I would love to do all these things right now!"

One of the earliest and most frequently cited cross-sectional study of the link between exposure to violent video games and aggression (Anderson & Dill, 2000, Study 1) used a measure of violent video game exposure. Furthermore, it measured both aggressive behavior and violent behavior. Both milder forms of aggression and more serious forms (i.e., violence) were positively related to exposure to violent games, even after controlling for gender.

Recently, many high-quality studies from numerous countries, including the US (Anderson et al., 2007, Study 3), Germany (Möller & Krahé, 2009), and Singapore (Gentile et al., 2014) have found that high levels of violent video game play at one point in time (e.g., beginning of a school year) led to increases in aggressive thinking (e.g., hostile attribution bias) at a later point in time, which also led to increases in aggressive behavior (e.g., getting into fights at school).

Violent media effects often are smaller on violent behavior than on milder forms of aggression, in large part because violent behavior is rarer and more difficult to predict (Gentile & Sesma, 2003). In meta-analytic reviews, the average correlation for aggression is about .20, whereas the average correlation for violence is about .10 (though some early meta-analyses of TV and movie violence effects reported considerably larger effects). Of course, there is not complete consensus on these findings (or any other scientific findings), especially by partisan defenders of violent video games. But, the bulk of evidence overwhelmingly indicates that exposure to violent media is a causal risk factor for aggression and violence. Meta-analyses have also found that exposure to violent media decreases feelings of empathy and compassion for others, and also decreases helping and other prosocial behaviors (Anderson et al., 2010; Greitemeyer & Mügge, 2014). These outcome variables also fit in the GAM. We believe the GAM is a valuable theory when it comes to explaining violent media effects.

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SEE ALSO: Meta-Analysis; Desensitization; Catharsis Theory; Aggression; Prosocial Behaviors; Hostile Media Effect

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Brad J. Bushman is Professor of Communication ~~and Psychology~~ and Rinehart Chair of Mass Communication, The Ohio State University. For over 30 years he has studied aggression and violence. He was a member of President Obama's gun violence committee, and has testified before the U.S. Congress on youth violence. He has published over 200 peer-reviewed journal articles, which have been cited ~~about~~ ~~40~~ 000 times (ranked #2 among communication scholars). He received the Distinguished Lifetime Contribution to Media Psychology and Technology from the American Psychological Association, and the Kurt Lewin Award from the Society for the Psychological Study of Social Issues.

Craig A. Anderson is Distinguished Professor of Psychology, Iowa State University. His early work focused on attribution theory and social judgment processes. His current work focuses on the general aggression model, a bio-social-cognitive model integrating aggression theories from social, personality, developmental, and cognitive psychology. His recent empirical work mostly involves media effects. In 2017, he received the Kurt Lewin Award from the Society for the Psychological Study of Social Issues, for "outstanding contributions to the development and integration of psychological research and social action." In 2018, he received the Distinguished Scholar Award from the Society for Personality and Social Psychology.

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ABSTRACT

The general aggression model, or GAM for short, is a metatheory for understanding the roots of aggression. The GAM is especially useful for understanding how exposure to violent media can increase aggression. In the GAM, personal and situational variables independently and interactively influence a person's internal states (cognition, affect, arousal), which eventually influence behavior. Some people might be more vulnerable to violent media effects than other people, such as people who strongly identify with violent media characters or people who are characteristically aggressive. Such individual differences are personal variables. Exposure to violent media is a situational variable. Thus, there are three routes through which exposure to violent media can increase aggression—through aggressive thoughts, angry feelings, and physiological arousal. Exposure to violent media increases aggressive thoughts, angry feelings, and physiological arousal. Exposure to violent media also decreases feelings of empathy and compassion for others. Internal states, in turn, influence the attributions, decisions, and appraisals a person makes, such as whether an ambiguous action was accidental or intentional. Research shows that exposure to violent media increases hostile appraisals. That is, people who consume violent media are less likely to give someone the benefit of doubt. These findings explain why exposure to violent media increases aggression and decreases helping. People who have aggressive thoughts, who feel angry inside, who are aroused and stressed out, and who make hostile appraisals are especially likely to hurt others and especially unlikely to help others.

KEYWORDS

aggression; aggressive behavior; GAM; general aggression model; media violence; violent media