A Review of the Effects of Violent Video Games on Children and Adolescents

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A Review of the Effects of Violent Video Games on Children and Adolescents

Jodi L. Whitaker*
Brad J. Bushman**

Abstract

Violent video games present a number of dangers to children and adolescents. The effects of violent video games and the psychological processes through which such video games can affect the player are reviewed. Moderators of the relationship between violent video game effects are examined, including individual differences and game characteristics.

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I. Introduction

Children and adolescents today spend most of their time going to school and consuming media. On average, children spend about forty hours per week watching television and films, listening to music, playing video games, and spending time online.\(^1\) In a nationally representative sample of U.S. teens,\(^2\) "99% of boys and 94% of girls play[ed] video games,"\(^3\) and 70% of nine- to eighteen-year-olds report playing violent M-rated (for Mature players seventeen and older) games.\(^4\) Indeed, it is difficult to find a video game devoid of violence, as an astounding 89% of video games have been found to include some violent content.\(^5\) Furthermore, more than half of E-rated (for Everyone) games contain violence.\(^6\)

With such high levels of exposure to violent content in games, it is imperative to understand the impact that such content can have on children. This Article will review the scientific research concerning both the effects of violent video games on children and the theories that explain why these effects occur. Individual differences among the players and characteristics of the games that influence how much the players may be affected will then be examined.

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3. Id.


II. Violent Video Game Effects

The research on the effects of violent video games mirrors the large body of research on the effects of violent television programs and films. All research methods have their strengths and weaknesses. However, a variety of research methods, including laboratory experiments, field/natural experiments, and longitudinal and cross-sectional studies have shown that violent video games increase aggression. Scientists call this convergence of evidence triangulation.

Although many of the effects of violent games mirror the effects of violent television, there are at least three reasons to believe that violent video games have stronger effects on aggression than violent television programs. First, video game play is an active process whereas watching television is passive, and "[people] learn better when they are actively involved." For example, suppose a person wanted to learn how to fly an airplane. Which of the following instruction methods would be preferable: reading a book, watching a television program, or using a video game flight simulator? Second, players of violent video games are more likely to identify with a violent character.

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8. See NORMAN K. DENZIN, SOCIOLOGICAL METHODS: A SOURCEBOOK 471 (5th ed. 2006) ("No single method is always superior. Each has its own special strengths, and weaknesses.").

9. See Craig A. Anderson et al., Longitudinal Effects of Violent Video Games on Aggression in Japan and the United States, 122 PEDIATRICS 1067, 1067 (2008) ("These longitudinal results confirm earlier experimental and cross-sectional studies that had suggested that playing violent video games is a significant risk factor for later physically aggressive behavior . . . .").

10. See DENZIN, supra note 8, at 471 ("It is time for sociologists . . . to move on to a position that permits them to approach their problems with all relevant and appropriate methods, to the strategy of methodological triangulation.").

11. See Craig A. Anderson et al., The Influence of Media Violence on Youth, 4 PSYCHOL. SCI. PUB. INT. 81, 90 (2003) ("[O]n the whole, the results reported for video games to date are very similar to those obtained in the investigations of TV and movie violence.").

12. See id. ("Violent video games have recently surpassed . . . violent TV as a matter of concern to parents and policymakers.").


14. See Craig A. Anderson & Karen E. Dill, Video Games and Aggressive Thoughts, Feelings, and Behavior in the Laboratory and in Life, 78 J. PERSONALITY & SOC. PSYCHOL. 772, 788 (2000) ("When viewers are told to identify with a media aggressor, postviewing aggression is increased compared with measured aggression of those who were not instructed to identify with the aggressor.").
game is a first person shooter, players have the same visual perspective as the killer. If the game is third person, the player controls the actions of the violent character from a more distant visual perspective. In either case the player is directly linked to a violent character, whereas in a violent television program viewers might or might not identify with a violent character. Third, violent games reward violent behavior, such as by awarding points or allowing players to advance to the next game level. In some games, players are rewarded through verbal praise, such as hearing the words "Nice shot!" after killing an enemy with a gun. It is well known that rewarding behavior increases its frequency. (Would people go to work if their employers did not reward them by paying them money?) In television programs, a reward is not directly tied to the viewer's behavior. Any reward experienced is indirect, such as watching the "good guys" win. A recent study provided the first evidence that playing violent games produces stronger effects than passively watching someone else play them. In this study, some participants played violent games while others watched the games being played, and the effects on aggression were stronger for boys who played video games than for boys who watched others play the games.

A. Aggressive Behaviors, Thoughts, and Emotions

One of the primary public concerns about violent video games is fear over the kind of behaviors the players will assume as a result of their exposure to the games. Evidence points to an increase in aggressive behaviors both in the short run and in the long run. Experimental studies have shown that playing

15. See id. (explaining that a video game player's active choice to commit violence may make future aggressiveness more likely than would the passive viewing of television violence).

16. See John A. Bozza, Benevolent Behavior Modification: Understanding the Nature and Limitations of Problem-Solving Courts, 17 WIDENER L.J. 97, 110 (2007) ("[I]f a behavior is followed by something rewarding it will tend to be strengthened and increase in frequency.").

17. See Hanneke Polman, Bram Orobio de Castro & Marcel A.G. van Aken, Experimental Study of the Differential Effects of Playing Versus Watching Violent Video Games on Children's Aggressive Behavior, 34 AGGRESSIVE BEHAV. 256, 262 (2008) ("Active participation of actually playing the violent video game made boys behave aggressively more often than passively watching violence, as is the case in television.").

18. Id.

19. See Judith A. Vessey & Joanne E. Lee, Violent Video Games Affecting Our Children, 26 PEDIATRIC NURSING 607, 607 (2000) ("There has been concern about the effect of video games on children's behavior almost since their inception.").

20. See Anderson et al., supra note 9, at 1070 (finding that violent video games have both long- and short-term effects on children's aggression).
violent games directly causes players to behave more aggressively.\textsuperscript{21} These experimental studies typically expose participants to violent games for relatively short amounts of time (usually about fifteen to thirty minutes) before measuring aggression.\textsuperscript{22} Aggression typically is measured by allowing participants to blast a confederate (an actor) with loud noise through headphones.\textsuperscript{23} People who play violent video games give longer and louder noise blasts to their opponents than those who play nonviolent video games.\textsuperscript{24} Longitudinal studies reveal other, real-life examples of increased aggression, including higher numbers of arguments with teachers and more involvement in physical fights.\textsuperscript{25}

In addition to increasing aggressive behaviors, playing violent video games can also increase aggressive thoughts.\textsuperscript{26} After playing a violent game, people list more aggressive thoughts\textsuperscript{27} and interpret ambiguous stories in a more hostile manner.\textsuperscript{28} In fact, exposure to violent video games may lead the

\textsuperscript{21} See Craig A. Anderson & Brad J. Bushman, The Effects of Media Violence on Society, 295 SCIENCE 2377, 2377 (2002) ("Experimental studies demonstrate a causal link [between media violence and aggressive behavior].").

\textsuperscript{22} See, e.g., Craig A. Anderson et al., Violent Video Games: Specific Effects of Violent Content on Aggressive Thoughts and Behavior, 36 ADVANCES EXPERIMENTAL SOC. PSYCHOL. 199, 207–32 (2004) (describing three experimental studies in which subjects played video games for twenty minutes before various measures of aggression were assessed).

\textsuperscript{23} See, e.g., Anderson & Dill, supra note 14, at 783–89 (describing a study in which participants, after playing a video game for fifteen minutes, competed in a timed competition in which they could punish each other by sending a noise blast to their opponents’ earphones).

\textsuperscript{24} See id. at 786 ("[P]articipants who had played [the violent game] delivered significantly longer noise blasts . . . than those who had played the nonviolent game."); Bruce D. Bartholow & Craig A. Anderson, Effects of Violent Video Games on Aggressive Behavior: Potential Sex Differences, 38 J. EXPERIMENTAL SOC. PSYCHOL. 283, 286–87 (2001) (finding that participants who played violent video games gave longer and louder noise blasts than those who played nonviolent games).

\textsuperscript{25} See Anderson et al., supra note 9, at 1069–71 (describing a longitudinal study which found that playing violent video games increased children’s incidents of physical fighting over a period of time); Douglas A. Gentile, Paul J. Lynch, Jennifer Ruh Linder & David A. Walsh, The Effects of Violent Video Game Habits on Adolescent Hostility, Aggressive Behaviors, and School Performance, 27 J. ADOLESCENCE 5, 18 (2004) ("Students who play more violent video games are more likely to have been involved in physical fights and get into arguments with teachers more frequently.").

\textsuperscript{26} See Sandra L. Calvert & Siu-Lan Tan, Impact of Virtual Reality on Young Adults’ Physiological Arousal and Aggressive Thoughts: Interaction Versus Observation, 15 J. APPLIED DEV. PSYCHOL. 125, 127 (1994) ("This finding suggests that girls may think about the aggressive actions that they view, even if they do not necessarily act aggressively.").

\textsuperscript{27} See id. at 135 ("As expected, aggressive thoughts increased more for those who played the virtual reality game or simulated game movements, providing support for the social cognitive theory over the arousal theory.").

\textsuperscript{28} See Brad J. Bushman & Craig A. Anderson, Violent Video Games and Hostile
player to interpret many different situations in a more aggressive way—an effect known as the **hostile attribution bias**. Playing violent video games also can increase aggressive feelings in players. After playing a violent game, people report feeling more anxious and hostile. Empirical evidence also indicates that playing violent video games can lead to the development of a more hostile and aggressive personality.

### B. Physiological Arousal

The effects of violent video games are not only evident in aggressive thoughts, feelings, and behaviors—physiological changes also can occur during game play. Exposure to violent video games produces numerous

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29. *See* Barbara Krahd & Ingrid Möller, *Playing Violent Electronic Games, Hostile Attributional Style, and Aggression-Related Norms in German Adolescents*, 27 J. ADOLESCENCE 53, 55 (2004) ("Information processing on the basis of aggressive scripts can lead to the development of a 'hostile attributional style,' i.e., to the habitual tendency to interpret ambiguous stimuli in terms of hostility and aggression.").

30. *Id.*


32. *Id.* at 397; *see also* Mary E. Ballard & J. Rose Wiest, *Mortal Kombat™: The Effects of Violent Videogame Play on Males’ Hostility and Cardiovascular Responding*, 26 J. APPLIED SOC. PSYCHOL. 717, 724–26 (1996) (providing and analyzing the results of a study in which college students who played violent video games reported having more hostile feelings than those who played nonviolent games).

33. *See* Anderson et al., *supra* note 22, at 241 ("The present empirical results . . . lend support to the concern that repeated exposure to violent video games (or other violent media) might lead to development of an increasingly aggressive personality.").

34. *See*, e.g., Craig A. Anderson & Brad J. Bushman, *Effects of Violent Video Games on Aggressive Behavior, Aggressive Cognition, Aggressive Affect, Physiological Arousal, and Prosocial Behavior: A Meta-Analytic Review of the Scientific Literature*, 12 PSYCHOL. SCI. 353, 358 (2001) ("The seven independent tests of the link between video-game violence and physiological arousal, involving 395 participants, showed that exposure to violent video games
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changes in the body, including increased heart rate\textsuperscript{35} and increased skin conductance.\textsuperscript{36}

This physiological arousal later can affect how the player interprets a mild specific emotion (e.g., anger) to an unrelated event (e.g., enduring a teasing comment from a peer).\textsuperscript{37} This interpretation can cause the player to feel the emotion as more severe than otherwise because some of the emotional response stimulated by the violent game is misattributed to the provocation, a process called excitation transfer.\textsuperscript{38} This excitation transfer potentially could cause the player to act more aggressively—due to heightened arousal—in a situation where he or she normally might not act out.\textsuperscript{39}

C. Prosocial Behaviors

"'Prosocial behavior' refers to voluntary actions that are intended to help or benefit another individual or group of individuals."\textsuperscript{40} This can include giving physical aid to another person, donating money to charity, sharing toys, and other similar activities. A negative relationship exists between playing violent video games and exhibiting prosocial behaviors afterward; that is, exposure to violent video games decreases the likelihood that the player will engage in an activity that helps another person.\textsuperscript{41} For example, in one study

\begin{itemize}
\item \textsuperscript{35} See Christopher P. Barlett, Richard J. Harris & Callie Bruy, \textit{The Effect of the Amount of Blood in a Violent Video Game on Aggression, Hostility, and Arousal}, \textit{44 J. EXPERIMENTAL SOC. PSYCHOL.} 539, 545 (2008) ("Results from Study 1 suggest that playing a violent video game does increase hostility and heart rate over time.").
\item \textsuperscript{36} See Patricia Arriaga, Francisco Esteves, Paula Carneiro & Maria Benedicta Monteiro, \textit{Violent Computer Games and Their Effects on State Hostility and Physiological Arousal}, \textit{32 AGGRESSIVE BEHAV.} 146, 155 (2006) (finding an increase in research subjects' skin conductance levels during and after playing video games).
\item \textsuperscript{37} See Dolf Zillman, Jennings Bryant, Paul W. Comisky & Norman J. Medoff, \textit{Excitation and Hedonic Valence in the Effect of Erotica on Motivated Intermale Aggression}, \textit{11 EUR. J. SOC. PSYCHOL.} 233, 248–49 (1981) (discussing research results which tend to show that viewing erotic images can lead to the misinterpretation of later emotions).
\item \textsuperscript{38} Id. at 248; see also Jennings Bryant & Dolf Zillmann, \textit{Effect of Intensification of Annoyance through Unrelated Residual Excitation on Substantially Delayed Hostile Behavior}, \textit{15 J. EXPERIMENTAL SOC. PSYCHOL.} 470, 478 (1979) (finding that research subjects' "delayed hostile behavior . . . was more intense when the provoked subjects had been exposed to arousing films than when these subjects had seen a nonarousing film").
\item \textsuperscript{39} See Zillmann et al., \textit{supra} note 37, at 248 (explaining that college students who viewed disturbing images displayed antisocial reactions in later situations).
\item \textsuperscript{40} Nancy Eisenberg & Paul H. Mussen, \textit{The Roots of Prosocial Behavior in Children} 3 (1989).
\item \textsuperscript{41} See Brad E. Sheese & William G. Graziano, \textit{Deciding to Defect: The Effects of}
violent game players were much slower to help a violence victim than were nonviolent game players. Thus, it has been shown that violent video games increase aggressive thoughts, aggressive feelings, aggressive behaviors, and physiological arousal, and decrease prosocial behaviors.

III. Psychological Processes

Different psychological theories can explain the short-term and long-term effects of playing violent video games.

A. Explanations for Short-Term Effects

The short-term changes that occur in children's behaviors, thoughts, feelings, and arousal levels immediately after playing violent video games mainly can be accounted for by three psychological processes: the priming of already existing aggressive behavioral scripts, aggressive cognitions, and angry

Video-Game Violence on Cooperative Behavior, 16 PSYCHOL. SCIENCE 354, 356 (2005) ("[T]he current findings suggest that playing violent video games may undermine prosocial and altruistic motivation and promote competitive behavior in deliberate decision making."); Oene Wiegman & Emil G. M. van Schie, Video Game Playing and Its Relations with Aggressive and Prosocial Behavior, 37 BRIT. J. SOC. PSYCHOL. 367, 375 (1998) ("For the whole group of children it was found that heavy players of video games showed significantly less prosocial behavior than either the non-players or the moderate players groups.").

42. See Brad J. Bushman & Craig A. Anderson, Comfortably Numb: Desensitizing Effects of Violent Media on Helping Others, 20 PSYCHOL. SCI. 273, 276 (2009) (reporting that subjects who played violent games took over 450% longer to help than those who played nonviolent games).

43. See Anderson & Bushman, supra note 34, at 353–59 (providing a comprehensive review of the various negative effects that violent video games produce for those who play them).

emotional reactions; *mimicking* the aggressive scripts presented in the game; and *stimulation of physiological arousal* caused by the observation of violence. Each of these processes will be explained below.

**Priming.** Research conducted by neuroscientists and cognitive psychologists suggests that, in addition to holding numerous behavioral scripts, human memory consists of a large associative network consisting of many neural "nodes" and "links." Each node represents a concept, such as what the color red is or what anger feels like. Associations between concepts are denoted by links. For example, a link between the color red and the concept of anger could lead one to associate the color red with feeling angry. In this manner, thoughts, feelings, and behavioral tendencies and scripts are linked together in memory.

Exposure to a stimulus can activate concepts or "nodes" in memory; this activation spreads along the links to connected nodes and activates associated concepts. This process is called *priming*. Priming is subtle—it usually occurs without the person being aware of it. Because these particular nodes are activated, the person is more likely to experience certain thoughts, emotions, and behaviors related to those nodes. While playing a video game the player is exposed to many different stimuli, which may include weapons and violent acts. This exposure, in turn, can lead to the activation of different aggressive scripts and concepts, prompting the person to think, feel, and behave more aggressively afterward.

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45. Bushman & Huesmann, supra note 44, at 348–49.
47. See id. at 131 ("[E]ach isolated piece of knowledge being mentally represented is called a node.").
48. Id. at 132.
49. Id.
50. Id.
52. See John A. Bargh & Paula Pietromonaco, Automatic Information Processing and Social Perception: The Influence of Trait Information Presented Outside of Conscious Awareness on Impression Formation, 43 J. PERSONALITY & SOC. PSYCHOL. 437, 446 (1982) ("These findings [show] that social categories can be primed passively by presenting the priming information outside of the subject's awareness.").
53. See MOSKOWITZ, supra note 46, at 132 ("Activation starts at the node that has been triggered and will travel along whatever paths are present, flowing most easily and quickly along the paths that represent stronger associations.").
54. Id.
In a play or movie, scripts tell actors or actresses what to say and do. Similarly, in psychology, scripts define situations and guide behavior: A person first selects a script to represent a situation and then assumes a role in the script.\textsuperscript{55} One example is a restaurant script (i.e., enter restaurant, go to table, look at menu, order food, eat food, pay for food, leave tip, exit restaurant).\textsuperscript{56} A person possesses a multitude of scripts for deciding how to act in different situations. In each situation, the person first must select a script from memory to represent that situation and either accept or reject the script as a guide to behavior.\textsuperscript{57} Scripts can be learned through direct experience or through more indirect means by observing others, including media figures such as those in video games.\textsuperscript{58}

One famous example of priming is called the weapons effect, wherein just the mere sight of a weapon can increase aggressive thoughts and behaviors.\textsuperscript{59} Certainly this process is in effect when playing violent video games that contain many weapons.

**Mimicry.** The tendency to mimic or copy the actions of others is a very old condition. Our children and our evolutionary ancestors—primates—have an innate tendency to mimic the behaviors of those they observe.\textsuperscript{60} The discovery of "mirror neurons" in the brain points to a neurological basis for both mimicry and longer-term imitation.\textsuperscript{61} What we see in our environment is

\textsuperscript{55.} \textit{See} Robert P. Abelson, \textit{Psychological Status of the Script Concept}, 36 AM. PSYCHOLOGIST 715, 719 (1981) ("To behave a script, that is, to take a role such as customer in a restaurant, one not only must understand that such a possibility exists, but one must commit oneself to the performance of it.").

\textsuperscript{56.} \textit{Id.} at 715–27 (explaining the script concept through an example of a customer in a restaurant).

\textsuperscript{57.} \textit{See id.} at 719 ("First the individual must have a stable cognitive representation of the particular script. Second, an evoking context for the script must be presented. Third, the individual must enter the script.").

\textsuperscript{58.} \textit{See id.} at 722 ("The difference between a script and a habit is that a script is a knowledge structure, not just a response program, and thus there is access to it symbolically as well as through direct experience.").

\textsuperscript{59.} \textit{See} Leonard Berkowitz & Anthony LePage, \textit{Weapons as Aggression-Eliciting Stimuli}, 7 J. PERSONALITY & SOC. PSYCHOL. 202, 206 (1967) ("[I]t is altogether conceivable that many hostile acts which supposedly stem from unconscious motivation really arise because of the operation of aggressive cues.").

\textsuperscript{60.} \textit{See} Susan Hurley & Nick Chater, \textit{Perspectives on Imitation Volume 1, Mechanisms of Imitation and Imitation in Animals: From Neuroscience to Social Science} 47 (1st ed. 2005) ("[H]uman beings have a default tendency to imitate, automatically and unconsciously . . ."); Andrew N. Meltzoff & M. Keith Moore, \textit{Imitation of Facial and Manual Gestures by Human Neonates}, 198 SCIENCE 75, 75 (1977) ("We find that 12- to 21-day-old infants can imitate both facial and manual gestures.").

\textsuperscript{61.} \textit{See} Giacomo Rizzolatti, Luciano Fadiga, Vittorio Gallese & Leonardo Fogassi, \textit{Premotor Cortex and the Recognition of Motor Actions}, 3 COGNITIVE BRAIN RES. 131, 131–41
mirrored in our minds for the purpose of helping us learn to imitate it.\textsuperscript{62} The brain responds very similarly whether you are watching someone else do something or doing it yourself.\textsuperscript{63}

As a consequence of this tendency to mimic, children who observe others performing aggressive acts—whether through direct exposure or through the media—are more likely to mimic those aggressive behaviors immediately after observing them.\textsuperscript{64} This propensity to mimic the actions of others increases when the child identifies with the person or character.\textsuperscript{65} Children tend to identify with people and characters they perceive as being similar to themselves (in terms of gender, race, etc.) and as possessing traits that the children deem attractive.\textsuperscript{66}

**Stimulation of physiological arousal.** Violent video games often contain many action-packed sequences that increase the player’s physiological arousal, such as elevating heart rate and blood pressure.\textsuperscript{67} Such heightened arousal caused by exposure to violent content increases the probability that a person’s dominant response tendency—how he or she is most inclined to act—will be carried out in the short term.\textsuperscript{68} In this manner, a player who naturally has

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\textsuperscript{62} See id. at 137 (comparing "mirror neurons" to a pupil watching his music teacher and later trying to recall the teacher’s movements so he can replicate the music).

\textsuperscript{63} Id.

\textsuperscript{64} See generally ALBERT BANDURA, SOCIAL LEARNING THEORY (1997) (introducing the "social learning theory"—a psychological explanation for the reasons children mimic aggressive behaviors).

\textsuperscript{65} See Cynthia Hoffner, Children’s Wishful Identification and Parasocial Interaction with Favorite Television Characters, 40 J. BROADCASTING & ELECTRONIC MEDIA 389, 389–90 (2006) (explaining that people have a tendency to identify with television characters and then unconsciously to imitate the character’s behavior or personality).

\textsuperscript{66} See id. at 394–400 (providing research results showing that children tend to identify with television characters possessing either similar traits to themselves, or traits which the child finds desirable); Elly A. Konijn, Marije Nije Bijvank & Brad J. Bushman, I Wish I Were a Warrior: The Role of Wishful Identification in the Effects of Violent Video Games on Aggression in Adolescent Boys, 43 DEVELOPMENTAL PSYCHOL. 1038, 1039 (2007) ("Adolescents might select models that possess qualities they already have . . . or models that possess qualities they do not have but wish they had.").

\textsuperscript{67} See Arriaga et al., supra note 36, at 155–56 (finding that playing violent video games, particularly violent video games, causes physiological arousal in the player).

\textsuperscript{68} See Russell G. Geen & Edgar C. O'Neal, Activation of Cue-Elicited Aggression by General Arousal, 11 J. PERSONALITY & SOC. PSYCHOL. 289, 292 (1969) (concluding that any stimulus could cause general arousal in a person which, in turn, could trigger aggressive responses which may be dominant in a given situation).
aggressive tendencies will behave even more aggressively once they are aroused by observing violent content.69

The player does not need to have aggressive tendencies in order for the stimulation of physiological arousal to affect aggressive behavior.70 As explained above, a person may misattribute their increased arousal to an unrelated provocation via the process of excitation transfer.71 Because of this erroneous conclusion, the player may behave in a more aggressive manner.

B. Long-Term Effects

The long-term changes that occur after playing violent video games mainly can be accounted for by three psychological processes: observational learning of aggressive behaviors, classical and operant conditioning of aggressive responses, and desensitization of emotional processes elicited by violence.72 Each of these processes will be examined below.

Observational learning. Mimicry is the short-term copying of the actions of others.73 In contrast, observational learning refers to "the process through which behavioral scripts, world schemas, and normative beliefs become encoded in a [person]'s mind simply as a consequence of the [person] observing others."74 Whereas short-term mimicry needs only one exposure to the observed behavior for children to imitate the action, long-term observational learning usually requires repeated exposure or repeated rehearsal.75

Observational learning is a powerful extension of mimicry in that it can produce long-lasting changes in the way a person thinks, feels, and behaves.76 For example, extensive observation of violence (such as by playing violent video games for days at a time) can lead children to attribute more hostility to

69. See id. ("The results of the present experiment support the hypothesis that general arousal and aggressive cues interact to elicit aggressive responses.").
70. See Zillman et al., supra note 37, at 248 (finding that erotica stimulated aggression in males and explaining that this occurs because the general excitation evoked by the erotica is transferred to an aggressive response in the person's brain).
71. See supra notes 37–39 and accompanying text (explaining the theory of excitation transfer).
72. See Bushman & Huesmann, supra note 44, at 349 (describing briefly the psychological processes which produce long term effects as a result of violent video game play).
73. Id.
74. Id.
75. Id.
76. See id. (describing the long-term nature of observational learning and its effects).
others' actions—that is, to develop a hostile attribution bias. This change in thoughts, in turn, can increase the likelihood that the child will aggress over time. Similarly, repeated observation of aggressive characters and actions in violent video games can lead children to develop beliefs that aggression is normal and appropriate. This repeated exposure also can cause children to acquire behavioral scripts that include acting aggressively in many different situations.

Several factors influence the extent to which observational learning will affect the child. The more the child pays attention to the observed behavior, the more easily the child will learn the behavior. Additionally, the more the child identifies with the observed character, and the more the observed behavioral scripts are rewarded and deemed appropriate, the more firmly these scripts will be embedded in the child's mind. Finally, if the scripts and beliefs that the child acquires from observing others lead to positive outcomes for the child (for example, in the game Bully the character Jimmy Hopkins beats up his peers, earning the child more spending cash), these scripts and beliefs will be more resistant to change.

Classical and operant conditioning. Two well-known examples of behavior modification are classical conditioning and operant conditioning.  


78. See Kenneth A. Dodge, Gregory S. Pettit, John E. Bates & Ernest Valente, Social Information-Processing Patterns Partially Mediate the Effect of Early Physical Abuse on Later Conduct Problems, 104 J. ABNORMAL PSYCHOL. 632, 640 (1995) ("The findings suggest that in a community population the experience of intentional physical harm in the first 5 years of life occurs in about one in eight children and is associated with a fourfold increased risk for externalizing conduct problems in Grades 3 and 4.").

79. See id. at 641 (suggesting that children who repeatedly are subjected to violence "may learn that aggressive behaviors can lead to positive consequences for the attacker").

80. See supra notes 55–58 (explaining the theory of behavioral scripts).

81. See Bushman & Huesmann, supra note 44, at 349 ("[E]xtensive observation of violence biases children's world schemas toward hostility, and they then attribute more hostility to others' actions, which in turn increases the likelihood of children behaving aggressively themselves.").

82. Id.

83. See L. Rowell Huesmann & Nancy G. Guerra, Children's Normative Beliefs About Aggression and Aggressive Behavior, 72 J. PERSONALITY & SOC. PSYCHOL. 408, 409 (1997) ("[B]eliefs that are supported by internalized sanctions should be more stable and more resistant to situational influences.").

84. See MALCOLM HARDY & STEVE HEYES, BEGINNING PSYCHOLOGY: A COMPREHENSIVE INTRODUCTION TO PSYCHOLOGY 54 (5th ed. 1999) (explaining briefly the differences between classical and operant conditioning).
In classical conditioning, a natural response becomes associated with a neutral stimulus. For example, in Pavlov's famous experiments, a dog naturally salivates at the sight of food. By repeatedly pairing the presentation of food with the sound of a bell, the dog learns to salivate upon just hearing the bell.

Exposure to violence via playing violent video games also involves the vicarious conditioning of emotional reactions. Through classical conditioning, fear or anger can become linked with specific stimuli after only a few exposures to the game. "These emotions influence behavior in social settings away from the [game] through stimulus generalization;" that is, the player may "react with inappropriate fear or anger in a novel situation that is similar to one that the child has observed in the [video game]."

In the process of operant conditioning, certain behaviors and rewards that do not come naturally to the subject become associated with the presentation of particular stimuli. For example, a dog might learn that it will receive a treat if it shakes hands when its owner says "shake." In much the same manner, violent video games can reinforce certain behaviors for the player. Violent video games can condition children directly

86. Id. at 13.
87. Id. at 22.
89. See Joanne Cantor, "Mommy, I'm Scared": How TV and Movies Frighten Children and What We Can Do to Protect Them 5–19 (1998) (providing examples of college students who reported that they still feared certain circumstances because they had seen a horror movie involving a similar situation).
90. Bushman & Huesmann, supra note 44, at 349 (emphasis added).
91. Id.
92. See Hardy & Heyes, supra note 84, at 43 ("The term 'operant conditioning'... means roughly the changing of behaviour by use of a reinforcement which is given after the desired response.").
93. See Dave Grossman, Teaching Kids to Kill, in Shocking Violence: Youth Perpetrators and Victims—A Multidisciplinary Perspective 17, 25 (Rosemarie Scolaro Moser & Corinne E. Frantz eds., 2000) ("When people are frightened or angry, they will do what they have been conditioned to do."); David R. Shanks, Forward and Backward Blocking in Human Contingency Judgment, 37B Q. J. Experimental Psychol. 1, 19 (1985) (describing three research experiments in which subjects were exposed to video games and which found that a subject's "action-outcome contingency" could be altered through exposure to abnormal outcomes in the games).
to behave in more violent manners. In the course of playing a violent video game, the player may be rewarded with an increased score, a higher social reputation, or other positive benefits for performing aggressive acts like killing other characters. The player then may come to associate behaving aggressively with being rewarded, increasing the likelihood that he or she will act aggressively in the future with the expectation of receiving the conditioned reward.

Desensitization. Repeated exposure to violent video games also can cause the player to become affected less by the violence portrayed. This habituation of certain natural emotional and physiological reactions is called desensitization. Behaviors seen and conducted by the player that may be disconcerting at first (such as killing another character) begin to seem more and more normal after repeated observation and experience. Negative cognitive and emotional reactions the player initially may have felt habituate, and he or she no longer is bothered by such actions. This emotional habituation, in turn, may lead the player to cease feeling any negative effect when witnessing, planning, or performing other violent behaviors.

This desensitization also occurs for physiological reactions to violent content. As explained above, playing violent video games increases physiological arousal through elevated heart rate, skin conductance, and blood pressure. However, after repeated exposure to violent video games, these physiological changes can become blunted and may no longer occur.

94. See Grossman, supra note 93, at 24–26 (explaining how video games can condition children to react violently in various situations).

95. See supra note 92 and accompanying text (defining and describing the process of operant conditioning).

96. See Jeanne B. Funk, Children's Exposure to Violent Video Games and Desensitization to Violence, 14 CHILD & ADOLESCENT PSYCHIATRIC CLINICS N. AM. 387, 388 (2005) ("Desensitization to violence frequently is cited as being an outcome of exposure to media violence and a condition that contributes to increased aggression, because desensitization prevents the initiation of moral reasoning processes that normally inhibit aggression.").

97. Id.

98. See id. ("Occurring as an unconscious process over time, desensitization to violence can be defined as the reduction or eradication of cognitive and emotional and, as a result behavioral, responses to a violent stimulus.").

99. Id.

100. See id. ("[D]esensitization may result in part from diminished negative physiologic arousal.").

101. See supra Part II.B (discussing the effects of video games on physiological arousal).

102. See Nicholas L. Carnagey, Craig A. Anderson & Brad J. Bushman, The Effect of Video Game Violence on Physiological Desensitization to Real-Life Violence, 43 J. EXPERIMENTAL SOC. PSYCHOL. 489, 495 (2007) ("The present experiment demonstrates that violent video game exposure can cause desensitization to real-life violence.").
neurological study found that violent game players show decreases in a particular brain wave associated with being negatively affected by a stimulus. This reduced brain response then was associated with later aggressive behavior, suggesting a neurological basis for physiological and emotional desensitization associated with playing violent video games.

IV. Moderators of the Effects of Violent Video Games

The psychological processes which yield the effects produced by exposure to violent video games are affected by two different classes of variables: characteristics of the individual who plays the violent games, and characteristics of the violent games themselves. Each of these types of moderators will be examined below.

A. Individual Characteristics

Age is one of the most important characteristics that influence how much a person who plays violent video games may be affected by them. Children are especially at risk for experiencing the long-term psychological effects produced through exposure to violent games. Cognitive and neurological development, emotional maturity, and personality growth are not finished at young ages; thus, children are more vulnerable to changing their developing

103. See Bruce D. Bartholow, Brad J. Bushman & Marc A. Sestir, Chronic Violent Video Game Exposure and Desensitization to Violence: Behavioral and Event-Related Brain Potential Data, 42 J. EXPERIMENTAL SOC. PSYCHOL. 532, 537–38 (2006) (discussing research which shows "that repeated exposure to violent video games is reflected in the brain as blunted evaluative categorization of violent stimuli").

104. Id. at 538.

105. See Bushman & Huesmann, supra note 44, at 348–49 (discussing various characteristics of video games and of players which affect the psychological processes that yield negative effects from observing violence).

106. See id. at 351 (suggesting that children and adults are affected differently by exposure to violent video games).

107. Id.

scripts, beliefs, emotions, behaviors, and personalities as a result of exposure to violent video games.\textsuperscript{109}

Another key individual characteristic is trait aggressiveness—how aggressive the person is naturally.\textsuperscript{110} People who are high in trait aggressiveness behave more aggressively after being exposed to violent media (such as violent video games) than those low in trait aggressiveness.\textsuperscript{111} Exposure to media violence increases trait aggressiveness, which in turn increases the likelihood of aggressive behavior.\textsuperscript{112} However, this effect is not limited to one direction. According to the "downward spiral" model of aggression and media effects, youth who are more aggressive seek out more aggressive media, which in turn make the youth more aggressive; this creates a self-reinforcing cycle.\textsuperscript{113}

Finally, the gender of the player may affect how much he or she is influenced by a violent video game.\textsuperscript{114} The results of gender differences on aggression after playing violent video games have been mixed. Some studies show no gender differences in violent video game effects,\textsuperscript{115} whereas other studies demonstrate that males tend to exhibit greater amounts of aggression after playing violent games than do females.\textsuperscript{116} This inconsistency could be the

\begin{itemize}
\item \textsuperscript{109} Id.
\item \textsuperscript{110} See Brad J. Bushman, \textit{Moderating Role of Trait Aggressiveness in the Effects of Violent Media on Aggression}, 69 J. PERSONALITY & SOC. PSYCHOL. 950, 951 (1995) (defining "trait aggressiveness").
\item \textsuperscript{111} See id. at 953-54 ("[T]hese findings are consistent with the idea that habitual exposure to media violence can lead to the development of more extensive aggressive cognitive-associative networks in high trait aggressive individuals than in low trait aggressive individuals.").
\item \textsuperscript{112} Craig A. Anderson, Nicholas L. Carnagey & Janie Eubanks, \textit{Exposure to Violent Media: The Effects of Songs with Violent Lyrics on Aggressive Thoughts and Feelings}, 84 J. PERSONALITY & SOC. PSYCHOL. 960, 969 (2003).
\item \textsuperscript{113} See Michael D. Slater, Kimberly L. Henry, Randall C. Swaim & Lori L. Anderson, \textit{Violent Media Content and Aggressiveness in Adolescents: A Downward Spiral Model}, 30 COMM. RES. 713, 714 (2003) ("The central proposition of [the downward spiral] model is that although aggressive tendencies may lead youth to seek out media content consistent with those tendencies, the resulting exposure reinforces and exacerbates those aggressive tendencies.").
\item \textsuperscript{114} See Bartholow & Anderson, \textit{supra} note 24, at 286-88 (finding in one study that males were affected more by exposure to violent video games than were females).
\item \textsuperscript{115} See Bushman & Anderson, \textit{supra} note 28, at 1682 (finding no significant difference in increased aggression between males and females who were exposed to violent video games); Nicola S. Schutte, John M. Malouf, Joan C. Post-Gorden & Annette L. Rodasta, \textit{Effects of Playing Videogames on Children's Aggressive and Other Behaviors}, 18 J. APPLIED SOC. PSYCHOL. 454, 457 (1988) (same).
\item \textsuperscript{116} See Bartholow & Anderson, \textit{supra} note 24, at 287 (concluding that violent video games cause greater increases in aggression in males than they cause in females). \textit{But see} Anderson & Dill, \textit{supra} note 14, at 787 (finding that women showed a greater increase in
result of different measures of aggression employed across the studies, or of confounding gender with frequency of playing violent video games. Indeed, evidence indicates that males are more likely to play violent video games;\textsuperscript{117} the repeated play of more violent video games could desensitize males to violence, leading them to act more aggressively as a result of sheer greater exposure.\textsuperscript{118} One final explanation for gender differences could be related to the preponderance of male protagonists in violent video games.\textsuperscript{119} A recent study demonstrates that when female game players play as a female character in a violent video game, they experience more aggressive thoughts than when playing as a male character.\textsuperscript{120} This suggests that as more aggressive female characters are included in violent games, gender differences in aggression exhibited after play could dissipate.

B. Characteristics of Violent Video Games

Some of the characteristics of violent games may cause children to pay more attention to the game and/or to be affected more by the content.\textsuperscript{121} Violent games tend to be more action-oriented and thus are more likely to include scene changes, audio level variability, and a great amount of aggression than did men in one experiment, but suggesting that these results may be due to methodological influences).

\textsuperscript{117} See Kristen Lucas & John L. Sherry, Sex Differences in Video Game Play: A Communication-Based Explanation, 31 COMM. RES. 499, 499–500 (2004) ("Despite considerable debate regarding the effects of video games, one finding that has been stable throughout the past decades of research is that video games are liked more and played more by males than by females."); Shirley Matile Ogletree & Ryan Drake, College Students' Video Game Participation and Perceptions: Gender Differences and Implications, 56 SEX ROLES 537, 540 (2007) (describing an experiment which found that, among college students, men were significantly more likely to play video games than women).

\textsuperscript{118} See supra notes 96–104 and accompanying text (describing the process of desensitization in the context of violent video games).

\textsuperscript{119} See Berrin Beasley & Tracy C. Standley, Shirts vs. Skins: Clothing as an Indicator of Gender Role Stereotyping in Video Games, 5 MASS COMM. & SOC’Y 279, 289 (2002) ("Not only are women underrepresented in video games, but those who are present are less clothed than their male counterparts.").

\textsuperscript{120} See Matthew S. Eastin, Video Game Violence and the Female Game Player: Self- and Opponent Gender Effects on Presence and Aggressive Thoughts, 32 HUM. COMM. RES. 351, 367 (2006) ("[T]he current research supports the prediction that women playing with a female avatar elicit greater presence and aggressive thoughts.").

\textsuperscript{121} See L. Rowell Huesmann & Laramie D. Taylor, The Role of Media Violence in Violent Behavior, 27 ANN. REV. PUB. HEALTH 393, 403 (2006) ("Research has shown that the effects of media violence on children are moderated by situational characteristics of the presentation . . . ").
movement; these form characteristics are known to increase children’s attention. Children also may be more affected if the violence portrayed is seen as justified, if the violence is glamorized, if the game fosters identification with aggressive characters, or if the game is perceived as more realistic.

V. Conclusion

Video games and accompanying online content offer much in the way of excitement and entertainment for children and adolescents, and indeed many positive experiences can be derived from playing the games. However, parents should be aware of the dangers inherent in playing violent video games, and should monitor their youth’s game playing accordingly.

122. Id. at 403–04.
123. Konijn et al., supra note 66, at 1038.
124. See Charles Atkin, Effects of Realistic TV Violence vs. Fictional Violence on Aggression, 60 Journalism Q. 615, 619 (1983) ("The major experimental finding shows a violent incident presented as realistic news has greater impact on aggressiveness than the same scene portrayed as fantasy entertainment.").
125. See Lucas & Sherry, supra note 117, at 499 ("Video games have been linked to several positive benefits such as acquisition of computer literacy, improvement of cognitive and attention skills, development of positive attitudes toward technology, and entry into jobs in high-tech fields.").