

Media Violence and Children: A Complete Guide for Parents and Professionals, Second Edition
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Chapter 8

Violent Video Game Effects on Aggressive Thoughts, Feelings, Physiology, and Behavior

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In 1972 a new form of entertainment became commercially available with the release of the video game *Pong*. In *Pong*, two players tried to “hit” an electronic “ball” back and forth. From these humble beginnings, a revolution in the entertainment industry was born. Interactive game revenues are now significantly greater than the domestic film industry (“[Industrial Strengths](#),” 2000). In the United States alone, video game sales (including accessories) exceeded \$20 billion in 2012 ([Entertainment Software Association, 2013](#)). In this chapter, the term “video game” will be used to describe games played on video game consoles (e.g., PlayStation, Xbox), computers, hand-held video game devices (e.g., GameBoy), or cell phones. The last 15 years have yielded a massive increase in studies of video game effects, thereby allowing clearer answers to the more specific questions of violent video game effects on children, adolescents, and young adults. That is the focus of this chapter, though the reader should bear two things in mind: (1) research on other forms of media violence (e.g., TV, films) is also relevant, and the results from that broader body are generally consistent; and (2) there is a growing body of research demonstrating positive effects of video games.

TIME SPENT WITH VIDEO GAMES

Video games have become one of the dominant entertainment media for children in a very short time. In the mid-1980s children averaged about four hours a week playing video games, including time spent playing at home and in arcades ([Harris & Williams, 1985](#)). By the early 1990s home video game use had increased and arcade play had decreased. By the mid-1990s home use

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had increased to 4.5 hours per week for fourth grade girls and to 7.1 hours per week for fourth grade boys ([Buchman & Funk, 1996](#)). By the turn of the century, national surveys showed that school-age children (boys and girls combined) devoted an average of about seven hours per week playing video games ([Gentile & Walsh, 2002](#); [Woodard & Gridina, 2000](#)). Two national surveys of American youth ages 8 to 18 found that video game play increased from about 26 minutes a day in 1998–1999 ([Rideout, Foehr, & Roberts, 2010](#)) to almost 110 minutes a day a mere decade later ([Gentile, 2009](#)), an increase of over 400 percent.

Even very young children are playing video games. [Woodard & Gridina \(2000\)](#) found that preschoolers ages two to five average 28 minutes of video game play per day. Surprisingly, the amount of time children watch television has remained remarkably stable even as the amount of time devoted to video and computer games has increased. Thus, total screen time has been

increasing steadily, averaging over six hours a day for the average American child ([Rideout et al., 2010](#); see also [chapter 1](#), this volume).

Over the past 20 years, gaming changed from being primarily a children’s activity to being something adults also do; the average age of American gamers is 30 ([Entertainment Software Association, 2013](#)). A substantial portion of young adults play video games more than 20 hours per week (e.g., 3.8% of college freshman males; see [Pryor et al., 2012](#)). It is not difficult to find male college students who play 40 hours or more per week (Bailey, West, & [Anderson, 2010](#)). [Figure 8.1](#) displays the increase in the percent of entering college freshmen who reported playing at least 15 (solid lines) or at least 20 hours (dashed lines) per week during the prior year, from 1995 to 2012. Very few females (fewer than 1%) reported playing at such high levels.

Although the research evidence is still limited, amount of video game play has been linked with a number of risk factors for maladaptive development, including smoking ([Kasper, Welsh, & Chambliss, 1999](#)), obesity ([Berkey et al., 2000](#); [Subrahmanyam, Kraut, Greenfield, & Gross, 2000](#); [Vandewater, Shim, & Caplovitz, 2004](#)), attention problems ([Gentile, Swing, Lim, & Khoo, 2012](#); [Swing & Anderson, 2014](#); [Swing, Gentile, Anderson, & Walsh, 2010](#)) and poorer academic performance (e.g., [Anderson & Dill, 2000](#); [Anderson, Gentile, & Buckley, 2007](#); [Creasy & Myers, 1986](#); [Harris & Williams, 1985](#); [Lieberman, Chaffee, & Roberts, 1988](#); Lynch, Gentile, Olson, & van Brederode, 2001; [Roberts, Foehr, Rideout, & Brodie, 1999](#); [Van Schie & Wiegman, 1997](#); [Walsh, 2000](#); [Weis & Cerankosky, 2010](#)). All of these results parallel similar findings in the TV/film research domain.

PREFERENCES FOR VIOLENT VIDEO GAMES

Although video games are designed to be entertaining, challenging, and sometimes educational, most include violent content. Content analyses of video games show that as many as 89 percent of games contain some violent

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content ([Children Now, 2001](#)), and that about half of the games include violent content toward other game characters that would result in serious injuries or death ([Children Now, 2001](#); [Dietz, 1998](#); [Dill, Gentile, Richter, & Dill, 2001](#)). Several studies have shown that the official ratings of video games by the industry-sponsored group Entertainment Software Ratings Board (ESRB) underreport the amount of violence in the games ([Haninger & Thompson, 2004](#); [Thompson & Haninger, 2001](#); [Thompson, Tepichin, & Haninger, 2006](#)). Nonetheless, these official ratings still demonstrate that violent content is prevalent in the vast majority of games on the market ([Gentile, 2008](#)). For example, 91 percent of games rated as appropriate for “everyone 10 years and older” (E10 \square) contain an official violence descriptor, slightly higher than the percentage of mature-rated games (for 17 and older, 89%) that have such a descriptor.

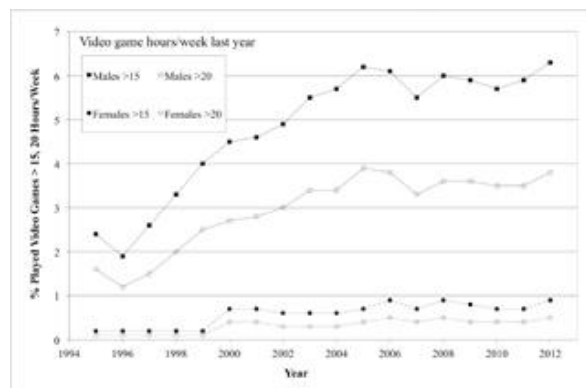


Figure 8.1
Percent of Entering College Freshmen in U.S. Colleges and Universities Who Report Playing Video Games at Least 15 and at Least 20 Hours per Week during the Previous Year, by Sex

Note: The survey began asking about time on social network sites in 2007.

Source: Data from the American Freshman survey series, 1995–2012.

Many children prefer to play violent games. Generally, researchers consider as “violent” those games in which the player can harm other characters in the game. In many popular video games, harming other characters is the main activity. (See Appendix A for recent recommendations regarding features of violent video games.)

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In studies of fourth- through eighth-grade children, more than half of the children reported preferring games in which the main action is predominantly human violence or fantasy violence (Buchman & Funk, 1996; Funk, 1993). In surveys of children and their parents, about two-thirds of children named violent games as their favorites. Interestingly, only one-third of parents were able to correctly name their child’s favorite game; in 70 percent of the incorrect matches, children described their favorite game as violent (Funk, Hagan, & Schimming, 1999). A large nationally representative sample of American children in 2004 found that 38 percent of 8- to 10-year-old boys had played *Grand Theft Auto*, an M-rated (“Mature”) game that involves playing the role of a criminal, hiring and killing prostitutes, and killing police and civilians in a wide variety of ways (e.g., clubs, guns, flame throwers, cars, rockets). Seventy-four percent of boys and 60 percent of girls 11 to 14 years old had played that particular violent game series (Rideout et al., 2010).

POTENTIAL FOR EFFECTS OF PLAYING VIOLENT VIDEO GAMES

Over a decade ago, there already had been over 280 independent tests involving over 51,000 participants of the effects of violent media on aggressive behavior (Anderson & Bushman, 2002a). The vast majority of those studies focused on television and movies. Meta-analyses (studies that measure the effects across many studies) have shown four main effects of watching a lot of violent entertainment. These effects have been called the *aggressor effect*, the *victim effect*, the *bystander effect*, and the *appetite effect* (Donnerstein, Slaby, & Eron, 1994; see also Strasburger & Wilson, this volume). These can be summarized as follows.

The *aggressor effect* states that people (both children and adults) exposed to a lot of violent entertainment tend to become meaner, more aggressive, and more violent.

The *victim effect* states that people (both children and adults) exposed to a lot of violent entertainment tend to see the world as a scarier place, become more scared, and initiate more self-protective behaviors (such as carrying guns to school, which, ironically, *increases* one’s odds of getting shot).

The *bystander effect* states that people (both children and adults) exposed to a lot of violent entertainment tend to become more desensitized to violence (both in the media and in real life), more callous, and less sympathetic to victims of violence.

The *appetite effect* states that people (both children and adults) exposed to a lot of violent entertainment tend to get an increased appetite for seeing more violent entertainment. Simply put, the more violence one sees, the more violence one wants to see.

The scientific debate over *whether* media violence has an effect has been answered, and the most interesting questions now involve whether some

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types of people are more likely to be affected and whether some types of media have a more powerful effect.

Why Violent Video Games May Have a *Greater* Effect Than Violent TV/Films

There are at least six reasons why violent video games might have an even greater impact than violent television (Anderson & Dill, 2000; Gentile & Walsh, 2002). These reasons are based on what is known from television and educational literature.

1. **Identification with an aggressor increases imitation of the aggressor.** Children tend to imitate aggressive actions more readily when they identify with an aggressive

character in some way. On television, it is hard to predict with which characters, if any, a person will identify. In most violent video games, however, the player necessarily takes the point of view of one particular character.

2. **Active participation increases learning.** This is one reason why computer technology in the classroom is considered to be educationally beneficial. Viewers of violent content on television are passive observers of the aggressive acts, whereas game players are active participants in the violent acts.
3. **Practicing an entire behavioral sequence is more effective than practicing only a part.** It is rare for television shows or movies to display all of these steps necessary to find and kill an enemy. Violent video games regularly require players to practice each of the many steps repeatedly. For example, the popular violent video game series *Rainbow Six* is so good at teaching all of the steps necessary to plan and conduct a successful special operations mission that the U.S. Army has licensed the game engine to train their special operations soldiers ([Ubi Soft, 2001](#)). Furthermore, the U.S. Army has created its own violent video game as a recruitment tool ([Associated Press, 2002](#)).
4. **Violence is continuous.** Research with violent television and movies has shown that the effects on viewers are greater if the violence is unrelieved and uninterrupted ([Comstock & Paik, 1991](#); [Donnerstein, Slaby, & Eron, 1994](#)). However, in both television programs and movies, violent content is rarely sustained for more than a few minutes before changing pace or changing scenes. In contrast, the violence in some violent video games is continuous.
5. **Repetition increases learning.** If one wishes to learn a new phone number by memory, one often will repeat it over and over to aid memory. With few exceptions (e.g., *Blue's Clues*), children rarely see the same television shows over and over. In a violent video game, however, players often spend a great deal of time doing the same aggressive actions (e.g., shooting things) over and over. Furthermore, the games are usually played repeatedly, thus giving a great deal of practice repeating the violent game actions. This increases the odds that not only will children learn from them, but will make these actions habitual to the point of automaticity.
6. **Rewards increase imitation.** There are at least three different reward processes involved. First, rewarding aggressive behavior in a video game (e.g., winning extra

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points and lives) increases the frequency of behaving aggressively in that game (see point 5 above; see also [Carnagey & Anderson, 2005](#)). Second, rewarding aggressive behavior in a video game teaches more positive attitudes toward the use of force as a means of solving conflicts. Television programs rarely provide a reward structure for the viewer, and it would be rarer still to have those rewards dependent on violent acts. In contrast, video games often reward players for participating. Third, the reward patterns involved in video games increase the player's motivation to persist at the game. Interestingly, all three of these processes help educational games be more effective. The latter process can make the games somewhat addictive.

The very first "violent" video game, *Death Race*, was released in 1976 by Exidy Games. It was a freestanding driving simulator arcade game. In it, one attempted to drive a "car" over little stick figures that ran around. When hit by the car, the stick figures would turn into tiny gravestones with crosses. Over the years, as technology improved, the violence became less abstract, more graphic, more realistic, and more human-centered (see [Gentile & Anderson, 2003](#), for a brief history of violence in games). In the current era of gaming (2005–present), even the smallest of platforms (e.g., cell phones) can have very high-quality images. Computer and console-based games now include photographic quality images. This era also has seen the growth of Internet-based games, some of which are quite simple, with low-quality graphics. Others are quite complex, involving large numbers of other players; some require team-based play. Bandwidth is the key to high-quality graphics and smooth play. Changes in technology have also produced changes in the nature of empirical studies of violent video game effects across time. Consider early experimental studies, in which participants

played either a randomly assigned violent or nonviolent video game and then engage in some task that allows a measure of aggression to be obtained. The difference between the treatment condition (violent game) and the control condition (nonviolent game) was likely to be relatively small in early studies, mainly because the early violent video games were not very violent. Now consider correlational studies, in which video game habits and aggressive behavior habits of participants are simultaneously measured and compared. In early studies of this type, participants who preferred to play violent video games and those who preferred to play nonviolent games likely had fairly similar video game experiences because there weren't any extremely violent games available. Thus, in both types of studies, early studies probably had pretty small differences in the independent variable of interest (i.e., amount of exposure to video game violence) and therefore might have discovered fairly weak effects. Furthermore, in the early years, there were probably social class differences in who could afford home video game systems.

Meta-Analytic Summary of Violent Video Game Effects

Narrative reviews of a research literature, such as that by [Dill and Dill \(1998\)](#), are very useful ways of examining prior studies. Typically, the researchers try to

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find an organizing scheme that makes sense of the varied results that typically occur in any research domain. However, as useful as such reviews of the literature are, meta-analyses (studies of studies) are a much more powerful technique to find the common effects of violent video games across multiple studies (see [chapter 13](#)). Specifically, a meta-analysis uses statistical techniques to combine the results of various studies of the same basic hypothesis, and provides an objective answer to the questions of whether or not the key independent variable has a reliable effect on the key dependent variable, and if so, what the magnitude of that effect is. The most comprehensive meta-analysis to date found that across 136 studies, a consistent pattern of the effects of playing violent games was documented in six areas ([Anderson et al., 2010](#)). [Figure 8.2](#) displays these results. It is worth noting that all of the published meta-analyses, *even those conducted by the critics*, find essentially the same results with a significant effect size ranging between about 0.10 and 0.29 ([Anderson, 2004](#); [Anderson & Bushman, 2001](#); [Anderson et al., 2010](#); [Anderson, Carnagey, Flanagan, Benjamin, Eubanks, & Valentin, 2004](#); [Bushman & Huesmann, 2006](#); [Ferguson, 2007a, 2007b](#); [Greitemeyer & Mügge, 2014](#); [Sherry, 2001](#)).

1. Playing violent video games increases the odds of aggressive behaviors. Studies measuring aggressive behaviors after playing violent video games have shown that aggressive behaviors are increased compared to playing nonviolent video games (e.g., [Anderson, Carnagey, Flanagan, et al., 2004](#); [Irwin & Gross, 1995](#); [Schutte, Malouff, Post-Gorden, & Rodasta, 1988](#); [Silvern & Williamson, 1987](#)). The average effect size across studies between violent game play and aggressive behaviors was 0.24 ([Anderson et al., 2010](#)). These effects have been found in children and adults, in males and females, and in experimental and nonexperimental studies. As can be seen in the first three columns in [Figure 8.2](#), the 95 percent confidence interval around this average effect size is quite small and does not come close to including zero. Thus, the results across these 79 independent tests involving over 21,000 participants are quite consistent.

In experimental studies, participants are randomly assigned to play violent or nonviolent games before the outcome variable is measured. For example, in a study of second-grade boys, those who played a violent video game were more likely than those who played a nonviolent game to be both verbally and physically aggressive toward peers in a free-play setting and a structured frustrating task setting ([Irwin & Gross, 1995](#)). Neither arousal nor impulsivity moderated the effects.

Other experimental studies have ruled out a host of alternative explanations and have extended the basic violent game effect on aggressive behavior in many ways. For example, [Anderson, Carnagey, Flanagan, et al. \(2004\)](#) controlled for a number of affective and arousal variables and showed that violent game content still increased physically aggressive behavior in college students. This rules out claims that violent games lead to more aggression only

because they are more (or less) fun, frustrating, or arousing than the comparison games used in experimental studies, or that only very young children who can't tell the difference between fantasy and reality can be harmed by violent video games. Likewise, although some recent work (e.g., [Adachi & Willoughby, 2011](#)) has suggested that some of the results of violent game studies might be due to the competitiveness of the games rather than the violent content, a series of experiments by Carnagey and colleagues has tested this claim and found that it cannot account for the violent game effects ([Anderson, & Carnagey, 2009](#); [Carnagey & Anderson, 2005](#)). For example, [Anderson and Carnagey \(2009\)](#) had male and female college students play one of two standard sports games or one of two extra-violent sports games that were matched on specific sport (two football and two baseball games), physiological arousal, enjoyment, excitement, and competitiveness. Also controlled were frustration and perceived difficulty of the games, and trait aggression and sex of the participants. Physical aggression was measured using a standard laboratory task in which participants delivered noxious noise blasts to an opponent. Participants who had just played one of the extra-violent sports games delivered 75 percent more high intensity noise blasts to their opponent than did those who had just played an equally competitive but nonviolent sports game.

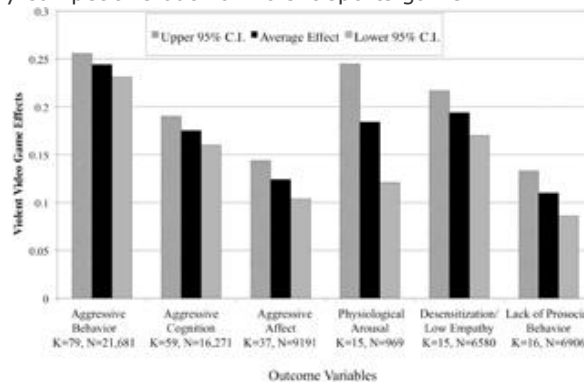


Figure 8.2
Violent Video Game Effects, Best Practices Studies

Source: Adapted from [Anderson et al., 2010](#).

Experimental studies from other countries, both Western and Eastern cultures, show that these effects are not limited to the United States or similar

countries (e.g., [Konijn, Bijmank, & Bushman, 2007](#); [Sakamoto et al., 2001](#)). On the whole, the average effect size of best practices experimental studies is about 0.21, as shown in [Figure 8.3](#).

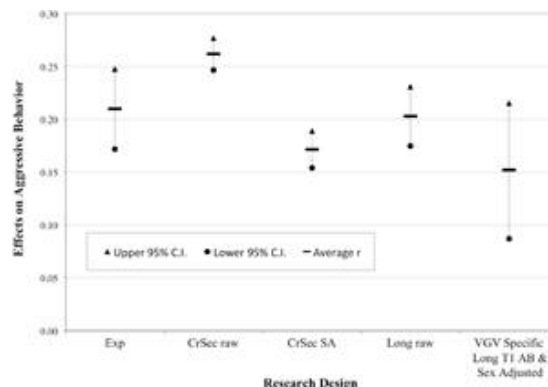


Figure 8.3

Effects of Playing Violent Video Games on Aggressive Behavior

Averages and 95% confidence intervals by research design. Exp □ experimental studies (same in best raw and best partials data); CrSec □ cross-sectional studies; Raw □ data from best raw samples; SA □ sex adjusted (data from best partials samples); Long □ longitudinal studies; VGV Specific □ studies that used the more specific type of video game violence exposure measure; T1 & SA □ Time 1 and sex adjusted.

Source: Adapted from [Anderson et al., 2010](#).

Cross-sectional correlation studies are those in which video game habits and an outcome variable (e.g., aggressive behavior in school) are measured at one point in time, often with several other control and explanatory variables. Such correlational studies are not as conclusive as true experiments in terms of establishing causality but are nonetheless very useful in testing causal theories and alternative explanations ([Prot & Anderson, 2013](#)). On average, the best estimates of the effect of violent video games on physical aggression in this type of study ranges from about 0.26 to about 0.17 ([Figure 8.3](#)), the latter being conservative ([Prot & Anderson, 2013](#)). In one such correlational study, young adolescents who played more violent video games were more likely to become involved in physical fights ([Gentile, Lynch, Linder, & Walsh, 2004](#)). This effect remained significant even when subject sex, trait hostility, and weekly amount of video game play were statistically controlled, thus

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simultaneously ruling out several key alternative explanations of the link between violent video game play and physical aggression.

The most significant development in this literature in the last decade is the arrival of several high-quality longitudinal studies. In such studies, the key measures of video game habits and the outcome variables are taken at two or more points in time that are separated by an appropriate time period (i.e., at least several months, often 12 months or longer). One can then test whether violent game exposure at the initial assessment predicts changes in aggressive behavior at later assessments even after controlling (statistically) for aggressiveness at the initial assessment. This allows for stronger causal conclusions because controlling for earlier aggressiveness rules out a large number of the most plausible alternative explanations, such as reverse causality (i.e., being an aggressive person causes one to play more violent video games) and third variable confounds (i.e., having psychopathic genes leads to both high aggression and a preference for violent games) ([Prot & Anderson, 2013](#)). Certainly, longitudinal designs are usually not as definitive as experimental ones in establishing causality, but because remaining noncausal alternative explanations must become increasingly convoluted, evidence that is consistent with the causal model from well-conducted longitudinal studies greatly increases scientists' confidence in the causal hypothesis.

There is now considerable longitudinal evidence that habitual exposure to violent video games causes an increase in the likelihood of physically aggressive behavior. The 2010 meta-analysis yielded average effect sizes ranging from about 0.20 to 0.15 ([Figure 8.3](#)). The first English-language longitudinal study of this type assessed video game habits, physical aggression, and several additional control and mediating variables in elementary school students at two points in time separated by an average of five months ([Anderson et al., 2007](#)). One major strength of this study was the use of multiple sources of information on physical aggression: teachers, peers, and self-report. The study yielded a significant long-term effect of early violent game exposure on later physical aggression, even after controlling for early levels of physical aggressiveness, sex, race, total screen time, hostile attribution bias (HAB), and parental involvement in media. Other studies from various countries have confirmed such longitudinal effects (e.g., [Gentile, Li, Khoo, Prot, & Anderson, 2014](#) [Singapore]; [Möller & Krahé, 2009](#) [Germany]; [Naito, Kobayashi, & Sakamoto, 1999](#) [Japan]; [Wallenius & Punamaki, 2008](#) [Finland]).

A recent Canadian longitudinal study tracked high school students over a four-year period and included a huge number of background variables, such as sex, parent SES, academic performance, depression, delay of gratification, peer deviance, sports involvement, friendship

quality, parental relationship, and school culture, among others ([Willoughby, Adachi, & Good, 2012](#)). This was made statistically feasible by the large sample size (over 1,400). They found a significant longitudinal effect of violent video game exposure even after statistically controlling for this wide array of variables.

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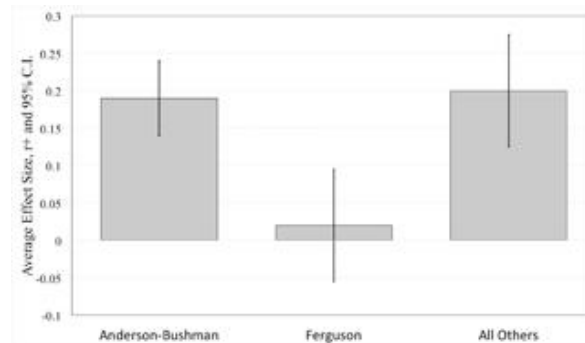


Figure 8.4

Comparison of Violent Video Game Effects on Overall Social Outcomes (Combined Behavior, Cognition, Affect, and Arousal) as a Function of Research Group

Source: Adapted from [Greitemeyer, 2014](#).

There are, of course, occasional studies that fail to find significant effects. Some of these may be the result of poor methods, small samples, or the normal amount of randomness that is observed in any set of empirical studies. Interestingly, a recent meta-analysis of modern era studies (2009–2013) compared the violent video game effect sizes reported by two different research teams (Anderson and/or Bushman-authored papers, versus Ferguson-authored papers) to effect sizes reported by all other research teams (Greitemeyer & Mügge, 2013). The reason for doing this was to empirically examine Ferguson's frequent claims that the Anderson and Bushman teams' studies are somehow biased and report inflated effect sizes. The fascinating result of this comparison was that the 20 studies (N = 8,595) by the Anderson and the Bushman teams found the same effects (average $r = 0.19$) as the rest of world (average $r = 0.20$, 58 studies, N = 23,415), whereas Ferguson's 7 studies (N = 2,444) yielded significantly smaller effect sizes (average $r = 0.02$) (see [Figure 8.4](#)). It is interesting that the researcher who has frequently accused others of bias is the one whose research findings are very discrepant from all the other researchers.

In sum, when all studies are included in appropriate meta-analyses (even those by Ferguson and his colleagues), the picture that emerges is one of consistency across research methods, research team (except Ferguson's), culture, age, and personality type. In sum, the current array of studies on

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violent video games demonstrates that violent games are a causal risk factor for aggression, both in the short term and across development.

2. Playing violent video games increases aggressive cognitions. Numerous studies have uncovered a strong link between playing violent video games and aggressive thinking. This is true of studies from all gaming eras (e.g., [Anderson, Carnagey, Flanagan, et al., 2004](#); [Graybill, Kirsch, & Esselman, 1985](#); [Kirsh, 1998](#); [Saleem & Anderson, 2013](#)). The average effect size across types of studies is about 0.17 to 0.18 ([Figure 8.2](#)). These effects have been found in children and adults, in males and females, in experimental and nonexperimental studies, and in Western and Eastern cultures ([Anderson et al., 2010](#)).

Aggressive cognitions have been measured in many ways. For example, [Anderson & Dill \(2000\)](#) found that playing a violent game primed aggressive thoughts, as measured by the relative

speed with which players could read aggression-related words on a computer screen. [Barlett and Rodeheffer \(2009\)](#) used a word completion task and found that briefly playing a violent video game increased the proportion of word fragments that were completed with aggressive words.

Studies of children's social information processing have shown that playing violent games increase children's hostile attribution biases. Hostile attribution bias (HAB) is important because children who have this social problem-solving deficit are also more likely to act aggressively and are likely to be socially maladjusted ([Crick & Dodge, 1994](#)). [Kirsh \(1998\)](#) randomly assigned third and fourth grade children to play either a violent or a nonviolent video game. Children were then presented with stories in which a same-sex peer caused a negative event to occur, but where the peer's intent was ambiguous, and were asked to explain the event. Violent video game-playing children gave responses attributing greater aggressive intent to the peer (i.e., they had greater HAB) than children who played the nonviolent game; they also were more likely to suggest retaliation.

[Bushman and Anderson \(2002\)](#) randomly assigned college student participants to play one of four violent or one of four nonviolent video games for 20 minutes. Next, participants completed three ambiguous story stems (ambiguous as to aggressive content) by indicating what the main character would do or say, think, or feel. Coders blind to experimental condition counted the number of aggressive actions, thoughts, and feelings contained in each story completion. Playing a violent video game increased aggressive story elements by over 40 percent. In a more recent study using the story completion method, [Hasan, Begue, and Bushman \(2012\)](#) replicated this expectation bias and found that it mediated the effect of a violent video game manipulation on later physical aggression.

[Uhlmann and Swanson \(2004\)](#) used the Implicit Attitudes Test procedure to assess self-associations to aggression. They found that playing a violent video game increased such self-associations.

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[Saleem and Anderson \(2013\)](#) used implicit and explicit measures of attitudes toward Arab/Muslims. College student participants who had just played a violent terrorism-themed video game displayed more anti-Arab attitudes than those who played a nonviolent game, even when the terrorism game was set in Russia and didn't involve Arab/Muslims. Interestingly, playing a violent game that did not involve a terrorism theme did not produce an increase in anti-Arab attitudes.

Numerous cross-sectional and several longitudinal studies have assessed the effects of violent video game exposure on aggression-related cognitions (e.g., [Anderson et al., 2007](#); [Möller and Krahe, 2009](#)). For example, in a longitudinal study of over 3,000 Singaporean children, aggressive cognitions (defined as HAB, normative beliefs about aggression, and aggressive fantasies) mediated the longitudinal effect ([Gentile et al., 2014](#)). That is, children who played more violent games began by the next year to have more aggressive thoughts, which predicted more aggressive behaviors the following year.

3. Playing violent video games increases aggressive affect (emotion). Studies measuring emotional responses to playing violent video games have shown that aggressive affect is increased as compared to playing nonviolent video games. The average effect size across 37 studies with over 9,000 participants between violent game play and aggressive affect was 0.12 ([Figure 8.2](#)). Interestingly, and as expected theoretically, the long-term effects on aggressive affect are considerably smaller than the immediate short-term effect, as shown by the differences in average effect size by design. The short-term experimental studies yielded an average effect size of 0.29, considerably larger than the cross-sectional studies (0.10) or the longitudinal studies (0.08) ([Anderson et al., 2010](#)).

There are fewer aggressive affect studies than aggressive behavior and cognition, in part because it is less interesting theoretically. That is, aggressive feeling can be activated temporarily by nonviolent video games too, especially if they are difficult or frustrating. Another reason that fewer aggressive affect studies meet the "best practices" criteria is that many studies intentionally control for aggressive affect in order to more cleanly test the effects

of violent game content on behavior or cognition. Nonetheless, violent video game effects on aggressive affect have been found in children and adults, in males and females, and in Eastern and Western cultures. In the first published experimental study, college student participants reported greater state hostility and anxiety levels after playing a violent game than after playing nonviolent games ([Anderson & Ford, 1986](#)). Other experimental studies have found similar effects in subsequent eras (e.g., [Arriaga, Esteves, Carneiro, & Monteiro, 2006](#); [Fleming & Rickwood, 2001](#)).

4. Playing violent video games increases physiological arousal. Experimental studies measuring heart rate, skin conductance, and systolic and diastolic blood pressure tend to show larger increases from violent games

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than from nonviolent video games (e.g., [Gwinup, Haw, & Elias, 1983](#); [Murphy, Alpert, & Walker, 1992](#); [Segal & Dietz, 1991](#)). The average effect size across studies between violent game play and physiological arousal was 0.18 ([Figure 8.2](#)). For example, [Ballard and Wiest \(1996\)](#) showed that a violent game (*Mortal Kombat* with the blood "turned on") resulted in higher systolic blood pressure responses than either a nonviolent game or a less graphically violent game (*Mortal Kombat* with the blood "turned off").

Other physiological reactions have also been found. Adult males' brains have been shown to release dopamine in response to playing a violent video game ([Koepp et al., 1998](#)). In addition, Lynch ([1994, 1999](#)) has found that the physiological effects of playing violent video games may be even greater for children who already show more aggressive tendencies. Adolescents who scored in the top quintile for trait hostility, measured by the [Cook & Medley \(1954\)](#) scale, showed greater increases in heart rate, blood pressure, and epinephrine and testosterone levels in the blood. There were also trends for increased levels of norepinephrine and cortisol in the blood for the more hostile children. This interaction with trait hostility suggests that the effects of playing violent games may be even greater for children who are already at higher risk for aggressive behavior.

5. Playing violent video games decreases prosocial behaviors. Studies have shown that playing violent video games decreases prosocial behavior, relative to playing nonviolent video games. This was found in early studies as well as in more recent ones (e.g., [Ballard & Lineberger, 1999](#); [Bushman & Anderson, 2009](#); [Chambers & Ascione, 1987](#); [Silvern & Williamson, 1987](#); [Wiegman & Van Schie, 1998](#)). The average effect size at the time of the most recent comprehensive meta-analysis was relatively small ($r = 0.11$)* but still significant ([Figure 8.2](#)). Furthermore, the average effect was significant for each of the three design types (experimental, cross-sectional, longitudinal).

In a cross-sectional study, [Gentile et al. \(2009\)](#) showed that violent video game play was negatively associated with helpful behavior in a large sample of Singaporean 12- to 14-year-olds, even after controlling for sex, age, total amount of game play per week, and prosocial video game play. They also reported an experimental study with U.S. college student participants in which briefly playing a violent game led to less helpful and more hurtful behavior than playing a neutral or prosocial game. Demonstrating that game content matters, this study also showed that playing a game with prosocial themes (rather than violent ones) increased prosocial behaviors after play.

Bushman and [Anderson \(2009\)](#) randomly assigned college student participants to play either one of four violent video games or one of four nonviolent games for 20 minutes. After game play, while completing a lengthy questionnaire alone, they heard a loud fight apparently taking place in the hallway outside the lab, in which one person was injured. Participants who had played

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one of the violent games took longer to help the injured victim, rated the fight as less serious,

and were less likely to “hear” the fight in comparison to participants who played a nonviolent game.

[Anderson et al. \(2007\)](#), and Yukawa & [Sakamoto \(2001\)](#) reported longitudinal studies showing similar negative effects of violent game habits on prosocial behavior with U.S. elementary students and Japanese high school students, respectively. In a more recent longitudinal study, [Prot, Gentile, Anderson et al. \(2014\)](#) assessed the effects of violent and prosocial video game play of over 3,000 Singaporean 9- to 13-year-olds on prosocial behavior two years later. They found that violent game play led to a decrease in later prosocial behavior even after controlling for initial level of prosocial behavior, empathy, prosocial game use, total game time, and sex (whereas prosocial game play increased prosocial behaviors).

6. Playing violent video games decreases empathy and increases desensitization. The 2010 meta-analysis found too few high-quality studies of empathy and desensitization to warrant separate meta-analyses of these two theoretically linked variables, so they were combined. There was a significant harmful effect of violent video game play: $r = -.19$. Exposure to violent video games led to relatively lower empathy/higher desensitization scores ([Figure 8.2](#)).

In the only experimental study, [Carnagey, Anderson, and Bushman \(2007\)](#), showed that playing a randomly assigned violent video game caused a significant reduction in physiological reactivity (cardiovascular function, skin conductance) to later scenes of real violence, relative to playing a nonviolent game. In a correlational study, [Funk, Baldacci, Pasold, & Baumgardner \(2004\)](#) found that in a sample of 8- to 11-year-olds, video game violence exposure was negatively related to trait empathy, even after controlling for sex, and for exposure to real-life, television, movie, and Internet violence. [Bartholow, Sestir, and Davis \(2005\)](#) found that in college students, violent video game exposure was negatively related to trait empathy and that this relationship partially mediated the violent video game effect on aggressive behavior. More recently, a longitudinal study ([Prot et al., 2014](#)) found that violent video game exposure in year 1 led to a decline in empathy in later years, and that this decline in empathy partially mediated the harmful longitudinal effect of year 1 violent video game exposure on year 3 prosocial behavior. [Figure 8.5](#) shows the longitudinal results.

MODERATORS OF VIDEO GAME EFFECTS

In the previous edition of this book, we noted that the research literature was too small to allow sensitive tests of potential moderator effects (moderator variables can enhance or diminish other effects). Such effects, essentially interactions between exposure to video game violence and the moderating variable (e.g., sex, age), require very large samples for adequate tests. The

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2010 meta-analysis included such a set of studies but still found very few moderation effects. For example, when physical aggression was the outcome variable, none of the participant characteristics (sex, age, culture) yielded significant moderation—that is, the effects were similar for younger and older ages, for both boys and girls, and for both Eastern and Western cultures.

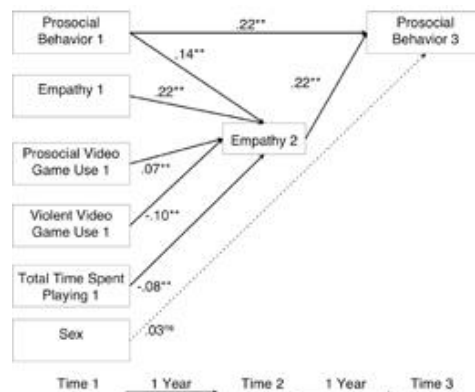


Figure 8.5

Path Model of Prosocial and Violent Video Game Use as Predictors of Empathy and Prosocial Behavior over Time

$\chi^2 \square 9.05$, $df \square 5$, $p \square 0.05$; $TLI \square 0.98$; $CFI \square 0.99$; $RMSEA \square 0.02$, 90% CI $\square 0.00 \square 0.03$. Standardized coefficients are shown; * $p \square 0.02$, ** $p \square 0.01$.

Source: Adapted from [Prot et al., 2014](#).

Nonetheless, there are theoretical, methodological, and empirical reasons to expect some groups to be somewhat more susceptible to violent video game effects than others, though existing theory and evidence does not provide reasons to expect any particular group to be totally immune. Funk and her colleagues ([Funk, 2001, 2003](#); [Funk & Buchman, 1996](#); [Funk, Buchman, & Germann, 2000](#)) have described how many of the effects of video game play could be enhanced by other personal characteristics and risk factors. These include player sex, age, status as bullies or victims of bullies, children with poor social problem-solving skills, and children with poor emotion regulation abilities. To this list we would add children who are generally more hostile in personality, who have a history of aggressive behavior, or whose parents do not monitor or limit their video game play. These risk factors will be described briefly below.

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Although there is insufficient evidence to make strong claims about certain groups being more vulnerable to violent video game effects, there are a few individual studies that provide some such evidence. For instance, [Markey and Scherer \(2009\)](#) found that the violent video game effect on state hostility and on aggressive cognition was somewhat greater for college student participants who scored high on a psychoticism measure than for those who scored low on psychoticism.

Longitudinal studies have repeatedly demonstrated that the best predictor of future aggressive or violent behavior is past history of aggression and violence ([Anderson & Huesmann, 2003](#); [U.S. Surgeon General, 2001](#)). [Bushman and Huesmann \(2006\)](#) conducted a meta-analysis of TV and video game effects as a function of age and type of study (short-term vs. long-term effects). They found some evidence that short-term effects (which rely on priming of well-established knowledge structures about aggression) are larger for older participants than for younger children, whereas long-term effects (which involve change in behavioral tendencies) are larger for children than young adults. Both of these trends make sense theoretically, in that younger children have relatively less well-developed aggression knowledge structures and relatively more malleable behavioral tendencies. However, it also important to note that the few studies that include both children and adults in the same study have not replicated the meta-analysis-based pattern. For example, [Anderson et al. \(2007, Study 1\)](#) experimentally manipulated whether children (9-to 12-years old) and college students played a violent or a nonviolent children's game and later assessed aggressive behavior using a standard laboratory task. In both age groups, the violent video game yielded significantly greater aggression than the nonviolent game. But in contrast to the [Bushman and Huesmann \(2006\)](#) meta-analytic finding, the short-term experimental effect of the video game manipulation was slightly larger for the children than it was for the college students.¹

Parental monitoring and limiting of children's media use has been found to be an important moderating factor with other media such as television. Limits on the amount of time, coviewing, and mediation (discussion) of television messages have been shown to have beneficial effects (e.g., [Austin, 1993](#); [Gadberry, 1980](#); [Robinson, Wilde, Navracruz, Haydel, & Varady, 2001](#); [Strasburger & Donnerstein, 1999](#)). Active parental involvement, such as rules limiting media use and active mediation (both positive encouragement to watch "positive" media and discouragement of "negative" messages) can be effective in influencing children's viewing, understanding, reactions to, and imitation of program content ([Dorr & Rabin, 1995](#); [Lin & Atkin, 1989](#)).

In the video game domain, only a few studies have tested parental involvement as a potential moderator, with mixed results. The experimental study in [Anderson et al. \(2007\)](#) described earlier found that participants whose parents were actively involved in their media use were significantly less affected by the experimental manipulation of violent versus nonviolent

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game play on aggression in the lab task. Also, in a correlational analysis of the children's self-reports of violent behavior history, it was found that parental involvement moderated the effect of media violence habits. That is, children whose parents were uninvolved in their child's media use showed a stronger relationship between exposure to media violence and behaving violently.

The longitudinal study reported in [Anderson et al. \(2007\)](#) also assessed parental involvement in their children's media habits. That study failed to find a significant moderating effect on physical aggression, as did a recent longitudinal study of 3,000 Singaporean youth ([Gentile et al., 2014](#)). Thus, as noted earlier, evidence of moderation of media violence effects by personal and family characteristics remains mixed at best. This, of course, contrasts with the generally consistent effects of media violence (and video game violence) on aggressive behavior, affect, and cognition.

When parents are asked if they have rules about the amount of time their children may play video or computer games, 62 percent say "yes," but if one asks the children themselves, that number drops to 32 percent ([Gentile, Nathanson, Rasmussen, Reimer, & Walsh, 2012](#)). When asked how often parents use the ratings to choose video games, only 34 percent of parents report using them "every time" or "most of the time" ([Gentile, Maier, Hasson, & de Bonetti, 2011](#)). Despite this apparent lack of consistent parental monitoring, parental limits on the time and content of video games are significantly related to lower levels of youth aggressive behavior (e.g., [Gentile et al., 2004](#)).

Although there appear to be general effects of playing violent video games on aggression and aggression-related outcomes, we believe that the effects are not likely to be identical for all children. The characteristics that we believe are most likely to emerge as significant risk factors for the negative effects of exposure to violent video games are: younger ages, poor social problem-solving skills, low parental monitoring, gender, hostile personality, and a history of aggression and violence. To date, none of these variables has yielded consistent moderation effects, in either the video game literature or the broader media violence literature. The fact that moderation effects have proven elusive suggests that the major effects of violent media are broad, apply to most people, and are more robust than any true moderation effect that the field has yet to identify.

NEW TRENDS AND CHALLENGES IN VIOLENT VIDEO GAME RESEARCH

New Trends

Although parents tend to be most concerned with potentially harmful effects of games, several new lines of research have documented that game effects are complex and that even violent games can have some benefits. In this section, we briefly highlight some recent trends in violent video game research.

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Effects of playing as a criminal

Several recent studies have examined the potential effects of playing violent video games in which the player takes the role of a criminal. The most notorious game series of this type, of course, is the highly popular *Grand Theft Auto* series (*GTA*), though there are other games that allow one to assume the role of an immoral or criminal character. Several experimental studies have found that playing a game as an immoral or criminal character can lead to increases in feelings of guilt (e.g., [Hartmann, Toz, & Brandon, 2010](#)). In one study ([Gollwitzer & Melzer, 2012](#)), college student participants played either a game that required violence against objects but not humans (*Flat Out 2*, in Demolition Derby mode) or a game that required criminal violence against humans (*GTA*), for about 20 minutes. Later, and supposedly as part of another study, they were shown a table with 10 products, 5 of which were hygiene related (e.g., shower gel), and were asked to indicate four that they would like to take with them. Consistent

with the authors' *moral cleansing* hypothesis, those who had just played *GTA* chose significantly more cleansing items than those in the other game condition. This effect was especially pronounced for relatively inexperienced players. Similar results were obtained on a moral distress measure.

Another experimental study ([Lee, Peng, & Klein, 2010](#)) randomly assigned college students to either a no-game control condition or to play *True Crime*, a game in which the main character—a police officer—uses excessive violence to catch lawbreakers and sometimes harms innocent people for fun. Those in the *True Crime* condition played the game for two hours. Later, all participants read four case histories, two real-life crime cases committed by police officers and two by generic criminals. After reading each case, they answered questions on their judgments of the crime and the criminal. Participants who played the violent game were more accepting of crimes and criminals compared to people who did not play the violent game. This effect was especially strong when the real-life criminal actions were perpetrated by police officers (matching the game role participants had played) and if the real criminal actions were similar to the activities they perpetrated during game play.

A fascinating pair of experiments reported by [Fischer, Aydin, Kastenmuller, Frey, & Fischer \(2012\)](#) had participants play either a delinquency-reinforcing video game (e.g., *Burn Out*, *GTA*) or a neutral game (*Tetris*). Experiment 1 found that players of a delinquency-reinforcing driving video game displayed more tolerance for a severe road traffic offense than players of the control game. Experiment 2 found that players of *GTA* were more likely to steal laboratory equipment (pens and candy bars) than players of the control game.

A recent cross-sectional study by [Gabbiani, Andrighetto, and Volpato \(2012\)](#) investigated the effect of playing *GTA* on moral disengagement, a process in which people shift their moral boundaries, creating a version of reality in which reprehensible conduct becomes morally acceptable ([Bandura, Barbaranelli, Caprara, & Pastorelli, 1996](#)). They found that Italian high school

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students who had played *GTA* scored higher on moral disengagement than those who had not. This effect remained significant even after controlling for sex, age, and overall exposure to video games in general.

Risk glorification effects

A recent review of research on the effects of exposure to media that glorify risk-taking behavior found strong evidence that such media, particularly active participation media (e.g., video games), causes an increase in the likelihood of later risk-taking behavior in the real world ([Fischer, Krueger, Greitemeyer, Asal, Aydin, & Vingilis, 2012](#)). For example, playing racing video games that encourage risky driving appears to lead to real riskier driving.

Effects on civic engagement

A recent cross-sectional study examined associations among video game habits, family characteristics, and civic engagement attitudes and behavior ([Anderson, 2013](#)). This study was based on a national U.S. sample of teens by the Pew Internet & American Life Project ([Lenhart et al., 2008](#)). Path analyses found that violent gaming was negatively associated with attitudes toward civic engagement and with civic engagement behavior, even after controlling for participant gender, age, social connectedness, internet use, parent education, parent involvement in their child's gaming decisions, and parent civic engagement. Prosocial and nonviolent gaming were positively associated with civic attitudes and behavior. Youth civic engagement was also predicted by social connectedness and by parent civic engagement. Parent involvement moderated the violent gaming effects; for both civic attitudes and behavior, parent involvement in youth gaming activities (which included talking about game content and limiting games) significantly moderated the harmful effects of playing violent video games. That is, a high level of parent involvement reduced (but did not eliminate) the negative effects of violent gaming on youth civic attitudes and engagement. [Figure 8.6](#) displays a simplified depiction of the main results.

Effects on attention and spatial cognition

Both positive and negative effects on visual attention have been found in video game studies.

For more detailed reviews, see [Bailey, West, and Anderson \(2011\)](#) and Prot, Anderson, Gentile, Brown, and Swing (in press).

Positive effects of violent video game play on visual-spatial skills have been found both in correlational and experimental studies. Gamers have been found to outperform nongamers on a number of visual and spatial tasks, demonstrating faster visual reaction times and improved target localization and mental rotation ([Achtman, Green, & Bavelier, 2008](#); [Green & Bavelier, 2003, 2007](#)). Experimental studies have shown that only 10 hours of

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video game play can improve spatial attention and mental rotation ([Feng, Spence, & Pratt, 2007](#); [Green & Bavelier, 2003](#)). Of course, improvement of visual-spatial skills can also be made by playing certain types of nonviolent video games (e.g., [Okagaki & Frensch, 1994](#)). Two additional issues should be noted, however. First, although these studies often are discussed in terms of improving “attention,” what is actually improved is merely the ability to notice things on a screen; it is not the kind of sustained and focused attention that classroom teachers mean when they discuss “attention.” Second, these positive effects appear to be narrowly limited to spatial skills very similar to tasks performed in the video games. Other studies suggest that these effects do not generalize easily to real-world navigation performance ([Richardson, Powers, & Bousquet, 2011](#)).

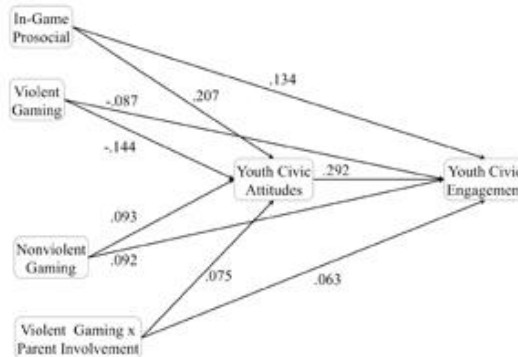


Figure 8.6

Effects of Violent, Nonviolent, and Prosocial Gaming and Parent Involvement on Youth Civic Attitudes and Behavior (Engagement); Full Final Path Analysis Model Showing Only the Key Gaming Variables and Directional Paths

Note: All paths are significant at $p < 0.05$. Standardized betas are shown. $N = 821$, $GFI = 0.99$, $CFI = 0.99$, $AGFI = 0.97$, $NFI = 0.97$. Chi-square (38) = 63.71, $RMSEA = 0.03$.

Source: Adapted from [Anderson, 2013](#).

Negative effects of video game play on other types of attention-related measures have been reported in recent years. These include problems such as attention deficit disorders, impulsiveness, self-control, school performance, executive functioning, and cognitive control. These effects remain even after controlling for sex, age, race, and socioeconomic status. Violent game playing has been linked with attention problems (e.g., [Hastings et al., 2009](#)), and

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some studies find that the violent content link explains some unique variance beyond the overall hours of video game playing ([Gentile et al., 2012](#)). Longitudinal studies have found that overall video game exposure is related to greater subsequent attention problems, even when earlier attention problems are statistically controlled ([Gentile et al., 2012](#); [Swing et al., 2010](#); for a review see [Prot et al., in press](#)).

A number of studies have found that violent video game play is associated with poorer executive control (e.g., [Hummer et al., 2010](#); [Bailey et al., 2011](#); [Kirsh, Olczak, & Mounts,](#)

2005; Mathews et al., 2005). One particularly disturbing finding comes from brain wave (ERP) research comparing high versus low gamers' brain responses to photos of people in positive, neutral, negative nonviolent (e.g., diseased), and negative violent (e.g., knife to someone's throat) states. One specific contrast suggested that high exposure to video game violence can result in violent and positive images taking on positive affective valence (Bailey et al., 2011). Swing and Anderson (2012) trained video game novices for 10 weeks on the same fast-paced violent video game (*Unreal Tournament*) that has been shown in prior studies to improve visual/spatial skills. Other participants were randomly assigned to train on a slower-paced nonviolent game (*The Sims*) or were in a no-training control condition. The results mirrored those of Green and colleagues, in that training on the violent game led to more improvement on a visual/spatial skill (Useful Field of View task) than in the two control conditions. What is unique about this study, though, is that proactive and reactive executive control were also assessed (using a Stroop task) (Green & Bavalier, 2007). Even as the violent game improved visual/spatial skill, it also reduced performance on the proactive executive control measure. A recent cross-sectional study of college students also suggests unique links between violent media exposure (including video games), certain types of attention problems, and impulsive aggression (Swing & Anderson, 2014). As can be seen in Figure 8.7, even after taking into account total time spent on electronic media, violent media exposure was still uniquely and directly associated with attention problems (self-reported ADHD, impulsiveness), and indirectly (through attention problems, aggressive cognitions, and anger/hostility) to impulsive aggression.

Other problems

Two other important issues do not at present seem to be specifically related to the violent content of video games—school performance problems and video game (or Internet) addiction. Several cross-sectional and at least one experimental and one longitudinal study have linked video game use with poor school performance (e.g., Anderson & Dill, 2000; Chan & Rabinowitz, 2006; Cordes & Miller, 2000; Gentile, 2009; Sharif & Sargent, 2006). Similar results have been found for elementary school through college student participants. For example, a recent survey of a large, nationally representative

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sample of American children and adolescents found that nearly half (47%) of heavy media users get poor grades, compared to 23 percent of light media users (Rideout et al., 2010).

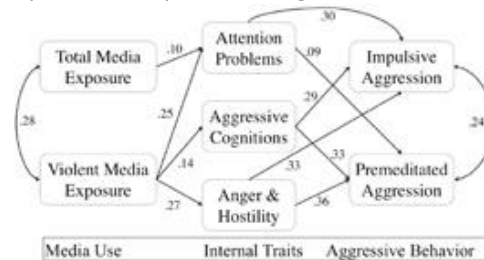


Figure 8.7
Effects of Total Screen Media Exposure and Violent Media Exposure on Attention Problems, Aggressive Cognition, Anger/Hostility, and Impulsive and Premeditated Aggression

CMIN: 15.37, df = 11, p = 0.166, GFI: 0.99, AGFI: 0.97, CFI: 0.99, RMSEA: 0.032 (90% CI: 0.000, 0.066). All paths are significant. Sex was included as a covariate, though the paths and coefficients are not displayed. Standardized path coefficients are reported.

Source: Adapted from Swing & Anderson, 2014.

In a study of eighth and ninth grade students (Gentile et al., 2004), lower grades were associated with both more years of video game play and with more hours played each week (by self-report). Path analyses yielded a significant effect of amount of video game play on school performance but no additional effect of violent game content. However, violent content showed an independent significant effect on aggressive behavior. This analysis lends support for considering amount of game play and content of game play as two independent potential

risk factors for children but for different outcome variables (i.e., school performance, aggression; see [Gentile, 2011](#), for discussion of the five dimensions along which games can have unique effects). Other research further supports the idea that video game time displacing academic time is the primary way that video games pose a risk for poorer academic performance. For example, adolescent video gamers have been found to spend 30 percent less time reading and 34 percent less time doing homework than nongamers ([Cummings & Vandewater, 2007](#)).

A longitudinal study of elementary school children showed that total screen time significantly predicts poorer grades later in the school year, even while controlling for other relevant covariates ([Anderson, Gentile, & Buckley, 2007](#)). An experimental study by [Weis and Cerankosky \(2010\)](#) further

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confirmed that these effects are causal, in a sample of 6- to 9-year-old boys whose families did not currently have a video game system. First, the researchers did a baseline assessment of boys' academic achievement and parent- and teacher-reported behavior. Next, the boys were randomly assigned to receive PlayStation II video game systems either immediately or after the follow-up assessment four months later. During that four-month interval, boys who received the system immediately spent more time playing video games and less time on after-school academic activities than comparison children. They also had lower reading and writing scores and greater teacher-reported academic problems at the four-month follow-up than comparison children. The amount of video-game play time mediated the relation between video-game ownership and academic outcomes.

The second emerging video game problem that appears to owe more to the amount of time playing games than the violent content is video game (and Internet) addiction, or pathological gaming. Researchers define pathological use of video games in the same way as pathological gambling—focusing on damage to family, social, school, occupational, and psychological functioning ([Sim, Gentile, Bricolo, Serpelloni, & Gulamoydeen, 2012](#)). Like gambling, playing video games starts as a form of entertainment. It becomes pathological for some people when video games start producing negative life consequences. This condition (now called Internet gaming disorder) has recently been classified as a medical disorder in the Diagnostic and Statistic Manual of Mental Disorders (DSM-5).

Overall, studies examining pathological video gaming show good reliability and validity ([Gentile, Coyne, & Bricolo, 2013](#)). Regarding prevalence, one national study conducted in the United States with a sample of 1,100 youth found that 8.5 percent of youth gamers could be classified as pathological ([Gentile, 2009](#)). Similar percentages are found in several other countries, including 8.7 percent in Singapore ([Choo et al., 2010](#)), 10.3 percent ([Peng & Li, 2009](#)) and 10.8 percent ([Lam, Peng, Mai, & Jing, 2009](#)) in China, 8.0 percent in Australia ([Porter, Starcevic, Berle, & Fenech, 2010](#)), 11.9 percent in Germany ([Grüsser, Thalemann, & Griffiths, 2007](#)), and 7.5 percent in Taiwan ([Ko, Yen, Yen, Lin, & Yang, 2007](#)). These studies have not used a common methodology or definition, however, so each estimate of prevalence should be considered to be preliminary (although it is interesting that the percentages are so similar given the differences in methods and populations).

In both of these problems—school performance and pathological gaming—there is not yet adequate research that uniquely implicates violent game content as a causal culprit. Nonviolent games and Internet use can also displace time spent on academic, family, social, school, and occupational activities. Of course, it also is possible that violent action games may be particularly apt to cause such problems because of their ability to attract and maintain users' attention through brain systems involved in reward circuits or fight/flight circuits. More research is needed on these questions.

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NEW (AND CONTINUING) CHALLENGES

Any new research domain has strengths and weaknesses. When the new research domain appears to threaten the profits of some large industry, there is a tendency for that industry to deny the threatening research and to mount campaigns designed to highlight the weaknesses, obfuscate the legitimate findings, and cast doubt on the quality of the research and the researchers. The history of the tobacco industry's attempt to ridicule, deny, and obfuscate research linking smoking to lung cancer is the prototype of such efforts. This type of effort has been mounted by the video game industry and its supporters. We do not claim that there are no weaknesses in the video game research literature. Indeed, over recent years we have highlighted some of them and conducted research to address them. In this final section, we focus on two types of challenges, insufficient/invalid ones and remaining legitimate ones.

Insufficient/Invalid Challenges

1. There are too few studies to warrant any conclusions about possible negative effects.

This can be a legitimate concern if the small number of studies yields a lack of power to detect small effects. However, it is invalid when used to claim that the current set of video game studies do not warrant serious concern about exposure to violent video games. With over 100 published studies, especially several longitudinal studies, this is no longer a serious criticism.

2. There are problems with the external validity of lab experiments due to demand characteristics, participant suspicion and compliance problems, trivial measures, artificial settings, and unrepresentative participants.

These arguments against laboratory studies in the behavioral sciences have been tested many times, in many contexts, and in several different ways. Both logical and empirical analyses of such broad-based attacks on lab experiments have found little cause for concern ([Anderson, Lindsay, & Bushman, 1999](#); [Banaji & Crowder, 1989](#); [Kruglanski, 1975](#); [Mook, 1983](#)). Specific examination of these issues in the aggression domain have consistently found evidence of high external validity ([Anderson & Bushman, 1997](#); [Berkowitz & Donnerstein, 1982](#); [Carlson, Marcus-Newhall, & Miller, 1989](#); [Giancola & Chermack, 1998](#)). Furthermore, recent meta-analyses have found that the most heavily criticized laboratory procedure, the Competitive Reaction Time (CRT) task, yields essentially the same violent video game effects as other procedures that measure aggressive behavior. In short, studies using the CRT task do not yield biased or inflated effect sizes. Interestingly, a recent experimental study found that lab experiments and measures that do not sufficiently disguise the real intent to study violent video game effects on aggression leads to underestimates of the true effects ([Bender, Rothmund, & Gollwitzer, 2013](#)). Specifically, gamers who play lots of violent games intentionally sabotage studies by displaying artificially low levels of aggression when they suspect (correctly) that the study

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is about video games and aggression. This "anti-demand characteristics" effect may explain why a few studies find weak or no harmful effects; such studies tend to not report cover stories or suspicion checks.

3. Complete dismissal of correlational studies: "Correlation is not causation."

This is an overly simplistic view of modern science. Psychology and statistics instructors teach this mantra to introductory students but hope that they will gain a much more sophisticated view of methods and scientific inference by the time they are seniors. Whole fields of science are based on correlational data (e.g., astronomy). Correlational studies are used to test causal theories and thus provide falsification opportunities. A well-conducted correlational design, one that attempts to control for likely "third variable" factors, can provide much useful information. To be sure, correlational studies are usually less informative about causality than experimental ones. What is most important in determining causality is the whole pattern of results across studies that differ in design, procedure, and measures ([Prot & Anderson, 2013](#)).

4. There are no studies linking violent video game play to "serious" or actual aggression.

Although it is true that most studies focus on subclinical or noncriminal aggression (e.g.,

threats, verbal aggression, hitting)—the most typical types seen in childhood—numerous correlational studies have linked violent video game exposure to serious aggression. One of the earliest ([Anderson & Dill, 2000](#), Study 1) showed that college student reports of violent video game play in prior years were positively related to aggression that would be considered criminal (e.g., assault, robbery) if known to police. Other cross-sectional and longitudinal studies have included measures of real world aggression and violence, and have found that video game habits do predict serious forms of aggression (e.g., [Anderson et al., 2004, 2007](#); [DeLisi, Vaughn, Gentile, Anderson, & Shook, 2013](#); [Gentile et al., 2004](#); [Hopf, Huber, & Weiß, 2008](#)). For example, [DeLisi et al. \(2013\)](#) found a significant violent video game effect on violence by juvenile delinquents even after controlling for the effects of screen time, years playing video games, age, sex, race, delinquency history, and psychopathic personality traits.

5. Violent media affect only a few who are already disturbed.

As discussed earlier, there are some reasons (theoretical, empirical) to believe that some populations (e.g., more aggressive) will be more affected than others. No totally “immune” population has ever been identified, however, and some research has found the opposite result—that less-aggressive children are more affected by violent games (e.g., [Gentile et al., 2014](#)). It is certainly likely that the effect may be more noticeable for children who are already aggressive, but that is different from stating that they are more influenced (see [chapter 2](#), this volume).

6. Effects of media violence are trivially small.

This is ultimately a subjective judgment. It is the case that the effect sizes are in what is considered the “small” to “moderate” range. Violent video

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game effects are bigger than (1) effects of passive tobacco smoke and lung cancer; (2) exposure to lead and IQ scores in children; and (3) calcium intake and bone mass. Small effect sizes become more socially important when a large proportion of the population is exposed, when the effects accumulate across time, and when the outcomes are serious.

7. There is no consensus on the effects of violent video games.

At least nine meta-analyses of violent video games have been published ([Anderson, 2004](#); [Anderson & Bushman, 2001](#); [Anderson et al., 2004](#); [Anderson et al., 2010](#); [Ferguson, 2007a, 2007b](#); [Ferguson & Kilburn, 2010](#); [Greitemeyer & Mügge, 2014](#); [Sherry, 2001](#)). Two interesting things stand out. First, although they vary greatly in terms of how many studies they include, they find almost identical effect sizes for violent video games on aggressive thoughts, feelings, and behaviors (see [Table 8.1](#)). Second, although they find almost identical effect sizes, Sherry and Ferguson interpret the effect as unimportant, whereas Anderson and colleagues interpret it as highly important. It is normal for scientists to differ in their interpretations of data. Nonetheless, the numbers are empirically derived, and all of these meta-analyses seem to agree with each other.

Table 8.1

Effect Size Findings from Nine Meta-Analytic Reviews of Violent Video Game Effects on Aggression and Related Variables

	Anderson & Bushman (2001)	Sherry (2001)	Anderson (2004)	Anderson et al. (2004)	Ferguson (2007a)	Ferguson (2007b)	Ferguson & Kilburn (2010)	Anderson et al. (2010)	Greite & Mü (2014)
Number of independent estimates	54	25	86	55	25	21	27	381	85
Number of participants	4,262	1,716	11,014	15,491	4,205	3,602	12,436	130,295	34,456

Notes: □ □ Not provided; * □ Studies split into experimental and correlational studies, and no overall estimate was given.

Aggressive thoughts	.27	-	.24	.31/.24*	.25	-	-	.16	.25
Physiological arousal	.22	-	.16	.22	.27	-	-	.18	.22
Aggressive feelings	.18	-	.16	.29/.16*	-	-	-	.14	.17
Aggressive behaviors	.19	.16	.20	.23/.28*	.29	.14	.14	.19	.19
Prosocial behaviors	-.16	-	-.21	-.25/-.30*	.30	-	-	-.10	-.11

It is also interesting that although these authors appear to disagree with regard to how to interpret the link between violent game exposure and aggressive behavior, they do not disagree about the other effects. For example, although [Ferguson \(2007a, p. 479\)](#) feels that the evidence on violent games and aggressive behaviors is not compelling, he believes that the effects on aggressive thoughts, prosocial behaviors, and physiological arousal “appear to be more sound.” This seems odd, because thoughts and feelings are related to behaviors—so if the critics agree that violent games can influence thoughts and feelings, why do they conclude that there is no effect on behaviors? It seems, therefore, that the disagreement about the effects of violent video games is much more apparent than real. Meta-analyses agree that there is a non-zero relation between violent gaming and aggressive thoughts, feelings, arousal, and behaviors. It is also clear that the effect is not overwhelming—these are generally small to moderate effect sizes. This also fits well with existing theory and data about aggression: aggression is multi-causal, and therefore no single environmental factor should overwhelm all others (including genetic, personality, and situational factors).

8. Violent crime rates have dropped in recent years, so violent video games can't be a cause of violent behavior .

There are multiple problems with this argument. First, the effect of violent games is expected to be more easily detected in higher-frequency, low-level forms of aggression than in the low-frequency extreme forms such as murder. Second, it assumes that violent video games would exert such a powerful effect that they would totally overwhelm the effects of changes in laws, the economy, the number of police on the streets, improvements in survival rates from violent attacks, an aging population, the percent of young males serving

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in the military, or any of the approximately 100 other known risk factors for violent crime. For example, recent environmental research suggests that the reduction in blood levels of lead due to the outlawing of leaded gasoline accounts for much of the recent drop in violent crime rates ([Mielke & Zahran, 2012](#)). Furthermore, using societal level measures of violence to test psychological-level hypotheses is a statistical fallacy, known as the “ecological fallacy.” In short, the whole argument is based on an assumption that is known to be false—that media violence is the *only* factor that causally contributes to violent crime (cf., [Anderson & Bushman, 2002b](#)).

9. Violent video game effects on aggression are the result of com-petitiveness .

Although some studies (e.g., [Adachi & Willoughby, 2011](#)) suggest that controlling for competitiveness eliminates violent content effects, studies with better controls have found the opposite. For example, [Anderson and Carnagey \(2009\)](#) had college students play a randomly assigned extra-violent or normal-rules sports game. The games were equated on

competitiveness and sport. The extra-violent sports games yielded significantly greater levels of aggressive affect, cognition, and behavior, clearly showing that violent content caused an increase independent of competitiveness. This does not mean that competitiveness has no affect on aggression (see [Anderson & Morrow, 1995](#)), only that competitiveness can't fully explain short-term violent content effects, and probably can't explain long-term effects at all, although studies designed to test that hypothesis have not been conducted.

10. Controlling for personality effects wipes out the video game effect.

This is incorrect in several ways. First, experimental studies automatically control for individual differences, which is why experimental studies allow such strong causal conclusions. Second, longitudinal studies that control for the outcome variable at Time 1 (e.g., aggressive behavior tendency at the beginning of a school year) also control for personality variables. That is, if a child "has" an aggressive personality that is causally linked to aggressive tendencies, controlling for aggressive tendencies at the beginning of a school year also controls (at least partially, if not wholly) for personality effects on end of school year behavior. Third, video game experience is theoretically expected to change personality, so in certain types of studies (especially cross-sectional studies) controlling for aggressive personality (or personality variables known to be correlated with aggression) inappropriately removes a large portion of what is truly part of the violent video game effect ([Prot & Anderson, 2013](#)).

11. The media violence research community is biased.

Several different versions of this claim are out there, ranging from relatively mild claims that there is publication bias in favor of studies that "work" to outrageous claims that research teams selectively report only data analyses that work or make up their data. These claims ignore the evidence. For example, the 2010 meta-analysis included detailed analyses of selection and publication bias (see the section labeled "Sensitivity Analyses"). The results ruled out this claim.

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Interestingly, the most vocal critic of video game studies was given an opportunity to comment on the 2010 meta-analysis article (at the suggestion of Anderson to the editor). Yet as [Bushman, Rothstein, and Anderson \(2010\)](#) noted, Ferguson and Kilburn failed to identify any biased search processes, any biased search outcomes, or any studies that should have been but were not included in our meta-analysis. (See also the commentary by [Huesmann, 2010](#)). Furthermore, as discussed earlier, a recent meta-analysis ([Greitemeyer & Mügge, 2014](#)) showed that the research performed by this same vocal critic is discrepant from what the other research groups find ([Figure 8.4](#)).

LEGITIMATE CHALLENGES

1. Sample sizes tend to be too small in many studies.

Because the average effect size is about $r \approx 0.20$, the N (number of study participants) should be at least 200 to achieve 0.80 power (the likelihood detecting a true difference between groups). That is, a simple two-group experiment should have 100 participants in the nonviolent game condition and 100 in the violent game condition. If the study is designed to test more than this basic difference, such as looking for interaction effects between game and personality variables, then the sample size will need to be substantially larger. When N is too small, individual studies will *appear* inconsistent even if they all accurately sample the true effect ($r \approx 0.20$). The best way of summarizing the results of a set of too-small studies is to combine the results via meta-analysis, rather than using the more traditional narrative review that simply counts significant and nonsignificant tests.

This problem continues to crop up in the video game research literature and may worsen as researchers begin to conduct more complicated studies looking for complex interactions, such as whether first-person shooter games have a bigger effect on aggression than third-person shooter games. The sample size problem increases dramatically for these types of studies because the likely effect sizes of such interactions are quite small. For example, a recent highly publicized study claimed that violent games don't produce antisocial behavior ([Tear & Nielsen, 2013](#)). The study had four game conditions (antisocial, violent, prosocial, and neutral). The differences between each of these would likely be a small effect size, therefore power analyses

dictate a total sample of 1,096 participants. This published study had only 64 participants, which yields a *post-hoc* power of 0.09! It is not surprising they failed to find any statistically significant effects. Similarly, given that the likely effect sizes for certain types of longitudinal studies will be smaller than 0.20, new studies of this type will also need very large samples.

2. What is the proper or best control condition in experimental studies?

There are several important issues here. First, do comparison conditions differ sufficiently on the independent variable of interest? For most

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studies, this is whether the “violent” game is sufficiently violent and whether the “nonviolent” game is in fact nonviolent. Studies still occasionally fail this minimal requirement. Second, do the comparison conditions differ on other dimensions that might be related to the outcome variable? For example, was a “control” or “nonviolent game” condition more boring, annoying, fun, competitive, or frustrating than the violent game? Third, some dimensions along which video games can differ may be necessarily confounded with the dimension that the researcher wants to isolate. Sometimes, one can overcome this by reprogramming a video game ([Carnagey & Anderson, 2005](#)), or by creating one’s own video game. Finally, it may be impossible to experimentally control all relevant dimensions, in which case we recommend inclusion of appropriate pilot testing on relevant dimensions, inclusion of dimensional ratings in the main experiment (if feasible), and using appropriate statistical controls ([Gentile et al., 2009](#), Study 3).

3. More large-scale studies of more extreme forms of violence are needed.

In light of recent mass shootings by heavy users of violent media and calls by politicians to investigate why such shootings occur, it certainly seems reasonable to call for large-scale studies of extreme forms of violence, including various types of violent crimes such as assault, intimate partner violence, other forms of domestic violence, and even gun-related crimes. At the time of this writing, in the United States it is illegal for the CDC to fund research into gun violence if the findings may lead to gun control advocacy. Assuming that that problem is overcome, what is needed? Sample sizes for studies of more extreme forms of aggression will need to be substantially larger than past studies of media violence, likely in the tens of thousands. There are several reasons for this, including the fact that extreme behavior is rare, numerous risk factors should be assessed, and the unique effect size of each is likely to be very small. Second, new studies need to follow up the participants for many years, from a very young age through the high violence years (e.g., at least age 30). That is because some of the causal risk factors may come into play at a very young age and because the appearance of violent behavior can occur many years later. Third, the new studies need to take a risk and resilience approach (see [chapter 2](#)). Extreme acts of violence typically require the convergence of multiple risk factors and a simultaneous lack of resilience factors. If one wants to test whether a heavy media violence diet contributes to extreme acts of violence, it can be adequately tested only if the other main risk factors are also assessed. Playing a lot of violent video games won’t turn a normal 14-year-old who has few risk factors into a school shooter or a serial killer or a habitual violent offender. Similarly, no other single known violence risk factor will lead to such extreme forms of behavior. What has never been tested is whether high media violence exposure can increase the likelihood of extremely violent behavior when there are many other known risk factors present. The most relevant

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data to date on this question suggest that the answer is “yes” (e.g., [Huesmann, Moise-Titus, Podolski, & Eron, 2003](#)).

CONCLUSIONS

Research on violent video game effects has come a long way since the first edition of this book. We now know that violent video games have a host of causal effects on children, adolescents,

and young adults, mostly revolving around aggression-related outcomes. A number of new questions have also arisen in recent years, some concerning all video games and others concerning violent games.

Because the focus of this chapter is on violent video games, we have not reviewed the growing literature on positive uses of video games in education, health, and industry. Please keep in mind that we are fans of video games and of their positive uses (e.g., Prot, Anderson, Gentile, et al., in press), and hope that future research will lead to better understanding and use of well-designed games to influence people in positive ways.

APPENDIX A: LETTER TO PARENTS: HOW CAN YOU TELL IF A VIDEO GAME IS POTENTIALLY HARMFUL?

1. Play the game, or have someone else demonstrate it for you.
2. Ask yourself the following six questions:
 - Does the game involve some characters trying to harm others?
 - Does this happen frequently, more than once or twice in 30 minutes?
 - Is the harm rewarded in any way?
 - Is the harm portrayed as humorous?
 - Are nonviolent solutions absent or less “fun” than the violent ones?
 - Are realistic consequences of violence absent from the game?
3. If two or more answers are “yes,” think very carefully about the lessons being taught before allowing your child access to the game.

Source: Video Game Suggestions from Dr. Craig A. Anderson, April 23, 2002. Copyright Craig A. Anderson. The entire document can be found at http://www.psychology.iastate.edu/faculty/caa/VG_Recommend.pdf.

NOTE

1. Interestingly, this experimental study also included a measure of media habits. This allowed a test of whether the brief experimental manipulation of violent versus nonviolent video game play had different effects on participants who had a history of prior media violence exposure than on those who had little prior exposure to violent media. There was no significant moderation effect, indicating that participants with

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high and low media violence exposure were affected by the brief game play in pretty much the same way.

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