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CHAPTER 13

Prosocial, Antisocial, and Other Effects of Recreational Video Games

Craig A. Anderson
Center for the Study of Violence,
Department of Psychology, Iowa State University

Douglas A. Gentile
Center for the Study of Violence,
Department of Psychology, Iowa State University

Karen E. Dill
Media Psychology, School of Psychology,
Fielding Graduate University

Prosocial, Antisocial, and Other Effects of Recreational Video Games

Video games are immensely popular around the world. They are played on computers, handheld devices, cell phones, and game consoles. They are played at home, at arcades, at school, in automobiles, and virtually anywhere that an electronic device can be operated. The video game industry's revenues surpassed the movie industry's several years ago and surpassed the music industry's in 2008. A recent, nationally representative sample of U.S. teens found that 99% of boys and 94% of girls played video games (Lenhart et al., 2008). The amount of time spent playing games has increased over time (Escobar-Chaves & Anderson, 2008; Gentile & Anderson, 2003).

Author Note: Correspondence concerning this manuscript should be addressed to Craig A. Anderson, Iowa State University, Department of Psychology, W112 Lagomarcino Hall, Ames, IA 50011-3180. Phone: 515–294–3118; Fax: 515–294–6424; E-mail: caa@iastate.edu

Many children and adolescents play more than 20 hours each week; 40 hours of gaming per week is not uncommon among males (e.g., Bailey, West, & Anderson, 2010).

Much research has examined potential positive and negative effects of playing various types of video games. Most has focused on the deleterious effects of violent games (e.g., Anderson et al., 2010). Other research has focused on educational games (e.g., Murphy et al., 2002). Still other work has found that total time playing video games is negatively associated with school performance (e.g., Anderson & Dill, 2000; Anderson, Gentile, & Buckley, 2007), that prosocial video games can increase prosocial behavior (Gentile et al., 2009; Taylor, 2006), that exercise games are an attractive form of physical activity (Rhodes, Warburton, & Bredin, 2009; Sell, Lillie, & Taylor, 2008), and that some types of games can improve game-related visual attention skills (e.g., Green & Bavelier, 2003; Okagaki & Frensch, 1994). Some of the latest research has studied the implications of avatar use on outcomes as diverse as self-concept, social behavior, and even exercise. Thus, the simple good–bad dichotomy frequently posed by the general public and the press ("Are video games bad for children?") is inappropriate.

In this chapter, we focus on the effects of playing recreational video games—that is, games *not* specifically designed for use in educational or therapeutic contexts. (For a brief review of all types of video games, see Barlett, Anderson, & Swing, 2009.) We begin by describing the main theoretical perspectives needed to understand video game effects. Next, we review the known effects of recreational video games, focusing on prosocial effects (e.g., helping others), antisocial effects (e.g., hurting others; stereotyping others), and other effects on the individual (e.g., addiction, cognitive skills, exercise, attention control).

Theoretical Overview

Three complementary theoretical perspectives are particularly useful when contemplating the effects of playing video games. The *General Aggression Model* and its offshoot, the *General Learning Model*, describe the basic learning processes and effects involved in both short-term and long-term effects of playing various types of games. The *Five Dimensions of Video Game Effects* perspective describes different aspects of video games and video game play that influence the specific effects likely to occur. The *Risk and Resilience* perspective reminds us that the effects of video game play—prosocial, antisocial, and other—take place within a complex set of social and biological factors, each of which contribute to development of the individual's thoughts, feelings, and behaviors.

General Aggression Model and General Learning Model

The dominant models of social behavior in developmental, personality, and social psychology are all social-cognitive models. Along with numerous colleagues, we developed the General Aggression Model (GAM) to integrate and simplify a wide range of more specific social-cognitive models of aggression (e.g., Anderson & Bushman, 2002; Anderson & Carnagey, 2004; Anderson et al., 2007; Anderson & Huesmann, 2003; DeWall & Anderson, ~~in press~~). Briefly, GAM is a dynamic biosocial cognitive-developmental model that provides an integrative framework for domain-specific aggression theories. It includes situational, personological, and biological variables. GAM draws heavily on social-cognitive and social-learning theories that have been developed over the past 40 years by social, personality, cognitive, and developmental psychologists (e.g., Bandura, 1977; Berkowitz, 1989, 1993; Crick & Dodge, 1994; Dodge, 1980, 1986; Geen, 2001; Huesmann, 1982, 1988, 1998; Mischel, 1973; Mischel & Shoda, 1995). These perspectives paved the way for understanding the learning and developmental processes involved in shaping aggressive behavior and how such processes contribute to the development and change of personality. Figure 13.1 presents an overview of the model. (For more detailed views and descriptions, see the works cited earlier.)

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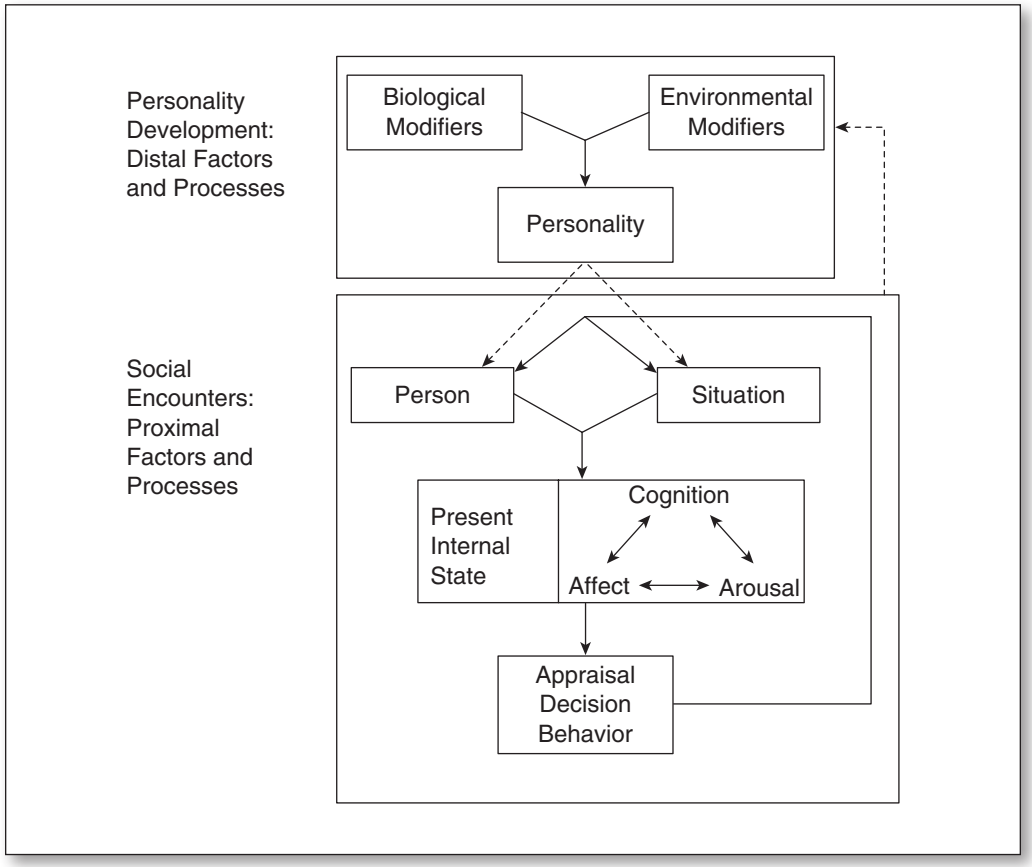
Figure 13.1 The General Aggression Model, Overview



Source: Adapted from *Violent Evil and the Aggression Model* (pp. 168–192), by C. A. Anderson and N. L. Carnagey, 2004, In A. Miller (Ed.), *The social psychology of good and evil*. New York: Guilford.

To understand aggression, or any social behavior, we must understand how such behavior in general depends on cognitive, affective, and arousal factors within the individual. Note that in Figure 13.1 no specific reference is made to aggressive behavior. One implication is that the model can be applied to other types of social behavior, such as helping other people. This generalization is the essence of what has become known as the General Learning Model (for more details, see Barlett & Anderson, in press; Buckley & Anderson, 2006; Gentile et al., 2009).

In any specific social encounter (lower portion of Figure 13.1), social behavior depends on how an individual perceives and interprets his or her environment and the people therein—on expectations regarding the likelihood of various outcomes, on knowledge and beliefs about how people typically respond in certain situations, and on efficacy beliefs about the ability to respond to the ongoing events. By understanding these perceptions and cognitions, researchers have a basis for understanding both within-person cross-situational stability across time (because people show stability in how they perceive their social world over time), between person variability within the same situations (because different people perceive situations differently), and between person similarity within the same or similar situations (because situations

frequently impose realistic demands that limit the number of options regarding how people can construe the situation). Furthermore, such social-cognitive models also account for variability in aggression across time, people, and contexts because different knowledge structures develop and change and different situational contexts prime different knowledge structures. The three main keys to these models involve discovering (1) what the person brings with him or her to the situations (knowledge structures, such as attitudes, beliefs, scripts, perceptual biases), (2) what types of knowledge structures are primed or activated by the features of the current situation, and (3) how various life experiences combine with biological predispositions to create and change personality, conceived of here as the person's set of operative knowledge structures.

GAM focuses heavily on how the development and use of knowledge structures influences both early (e.g., basic visual perception) and downstream (e.g., judgments, decisions, behaviors) psychological processes (e.g., Bargh, 1996; Collins & Loftus, 1975; Fiske & Taylor, 1991; Higgins, 1996; Wegner & Bargh, 1998). Of particular interest from cognitive psychology are findings showing that through repeated practice and exposure, complex judgments and choices become automatized, requiring little or no mental effort or conscious awareness (Bargh & Pietromonaco, 1982). With practice, one can learn to automatically scan the environment for threat, to perceive threat even in ambiguous situations, and to respond to threat with aggressive action. Alternatively, one can learn to automatically look for people in need of help, to perceive such needs quicker or more frequently than others, and to respond to this perception by offering help. Indeed, it is possible that both of these sets of knowledge structures could be well learned (automatized) within the same person.

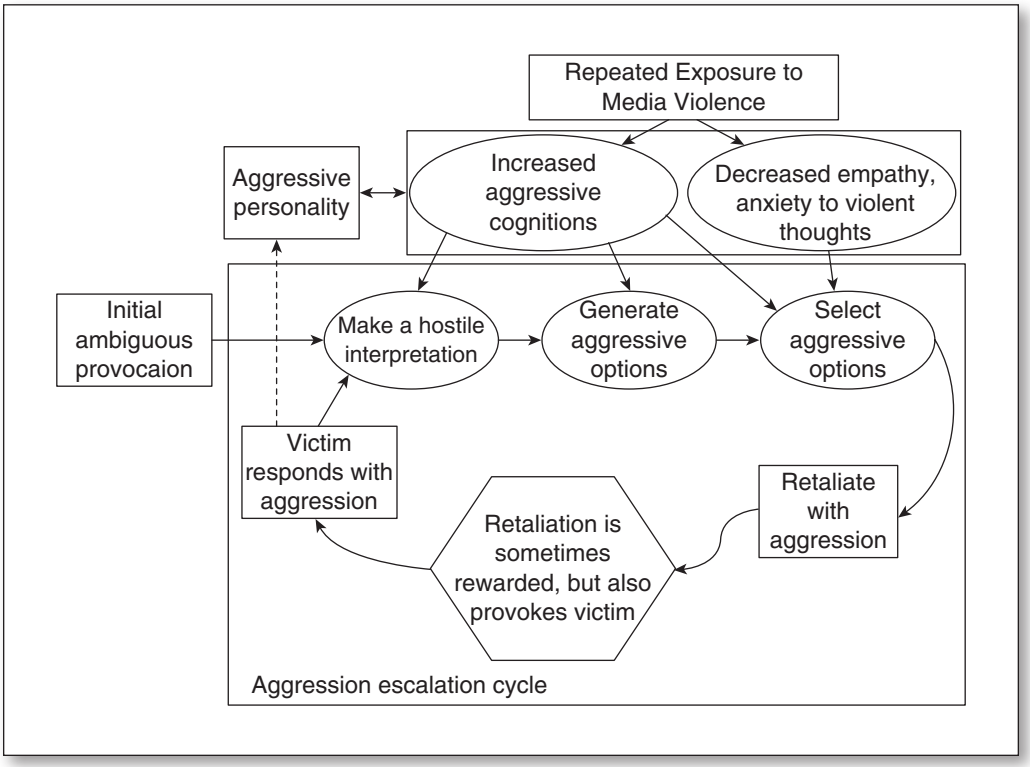
The learning processes involved include all of the well-studied processes of classical conditioning, instrumental conditioning, imitation, and higher order forms of learning. These learning processes, which result from discrete social encounters, affect what we think of as *personality,* illustrated by the dashed line linking the proximal portion of Figure 13.1 to the distal portion. In this way, the present event influences the future.

The past influences the present by affecting what the person brings with them to the situation (e.g., knowledge structures) and by influencing the kinds of situations the person is likely to encounter. Figure 13.2 illustrates one way in which repeated exposure to a specific type of environmental modifier—media violence—creates an aggressive personality, which in turn increases the likelihood of aggressive behavior in a specific situation. A similar figure could be produced to illustrate how repeated exposure to prosocial media can increase an altruistic personality and prosocial behavior.

Repeated exposure to media violence, such as playing violent video games, increases the accessibility of a host of aggression-related knowledge structures while simultaneously decreasing feelings of empathy for victims of violence and decreasing negative emotional reactions to violent thoughts, images, and scripts. In essence, such exposure increases the aggressive personality. When an ambiguous provocation of some kind occurs (e.g., getting bumped in a cafeteria or bar), the increased accessibility of aggressive schemata increases the likelihood that a hostile attribution for the event will be made. This increases the likelihood that aggressive response options will be generated and that they will be selected for action. In short, the person becomes more likely to retaliate. That retaliation itself produces an outcome that influences one's expectations and beliefs about the future. The dashed line indicates that such learning has an impact (small) on further personality development. The victim's response, very likely an aggressive one, sets the stage for the next episodic cycle of this social interaction event.

Again, keep in mind that the same type of dynamic process occurs with repeated exposure to prosocial media. Of course, in this case more prosocial thoughts, feelings, and shifts in personality are instigated by the media exposure, resulting in more prosocial behavior under the right circumstances.

Figure 13.2 Media violence effect on personality, and personality effect on aggression



Five Dimensions of Video Game Effects

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Gentile and his colleagues (Gentile, ~~in press~~; Gentile & Stone, 2005; Khoo & Gentile, 2007) have proposed five dimensions along which video games can have effects—the *amount, content, context, structure,* and *mechanics.* This approach explains how research findings that initially appear contradictory are actually congruent. Games and the ways people interact with them are multidimensional, and each dimension is likely to be associated with specific types of effects.

The *amount* of time that people spend on recreational games can have effects on them, regardless of specific game features. Studies have demonstrated that amount of time playing games predicts poorer school performance (see later section). Theoretically, this effect is likely due to displacement of other academically beneficial activities. Other studies have demonstrated a relationship between amount of sedentary gaming and obesity (Berkey et al., 2000; Laurson et al., 2008; Vandewater, Shim, & Caplovitz, 2004). Again, it is likely that sedentary games displace other more physically active activities, and children may also snack more while gaming than they otherwise would. Amount of gaming has also been implicated in repetitive stress disorders (Brasington, 1990), and in video game addiction (see later section).

Most of the research on video game effects has focused on the *content* dimension, with the bulk of that research focused on violent content. It should be no surprise that people learn the content of whatever games they play. If they play educational games, they learn the educational content and can apply it to their schoolwork (Murphy et al., 2002); if they play games designed to teach health content, they learn those concepts and apply them to their lives (Beale, Kato, Marin-Bowling, Guthrie, & Cole, 2007; Lieberman, 2001); if

they play violent games, they learn the violent content and may apply it to their lives (see sections that follows).

The *context* of game play may produce differential effects, but this is the dimension with the least research at this time. Context can be defined within the game or outside of the game. One type of within-game context can be seen in violent games that allow for either team-based or free-for-all modes of play. Both may be equally violent, but playing in an everyone-for-oneself mode might lead to greater aggressive thoughts, lower empathy, and greater desensitization. If the in-game context requires players to cooperate to achieve goals, this might also teach teamwork and social coordination skills. Furthermore, the social context outside of the game may matter. Playing a violent game in a room with other friends (virtual or real) might increase the aggression effect because players are giving each other social support for aggression. It might actually reduce the aggression effect, however, if one's motivations are prosocial (to help your friends). To our knowledge, no studies have yet tested these hypotheses.

How the game is structured and displayed on the screen can also have effects. This screen *structure* provides information that is learned, similar to how we learn to perceive other visual information (Gibson, 1979). Perceptual skills can be improved through practice, as has been shown in several studies (Green & Bavelier, 2003, 2006a, 2006b, 2007; Greenfield, DeWinstanley, Kilpatrick, & Kaye, 1994). Other studies have demonstrated an improved ability to get three-dimensional information from flat screens (Greenfield, Brannon, & Lohr, 1994) or improved mental rotation skills (Cherney, 2008) after playing games that require those skills.

Finally, the *mechanics* dimension refers to what can be learned from practice with different types of game controllers. Depending on the type of controller, several different skills could be improved, including fine motor skills (e.g., by using a thumb controller), gross motor skills (e.g., by swinging the Wii remote like a golf club), or balance skills (e.g., using the Wii balance board). These effects can be used intentionally, such as in physical therapy (Deutsch, Borbely, Filler, Huhn, & Guarrera-Bowlby, 2008) or to improve dynamic balance control after brain surgery (Betker, Szturm, Moussavi, & Nett, 2006). The intersection of structure and mechanics is the continuous feedback loop that is often referred to as hand-eye coordination.

One benefit of noting the dimensions on which games can have effects is that it allows us to recognize that the dichotomous question of whether games are good or bad is too simplistic. Games have multiple effects at multiple levels of analysis, some of which may be beneficial and some of which may be harmful, even within the same game.

Research Designs and Scientific Causality

Scientists use three main types of research designs to test theoretical models. Each type has characteristic strengths and weaknesses. No single study is thought of as conclusive, though some are stronger than others. Because no single empirical study can be wholly conclusive, researchers create and test theories using multiple studies and multiple study designs in order to *triangulate* on the clearest answer to the research question. Different designs are used to test various plausible alternative hypotheses. By ruling out such alternatives, the main causal hypothesis gains strength. If a plausible alternative explanation remains viable, then additional empirical tests or a modification of the theory is required. In sum, it is the total picture of combined studies that answers the question of whether or not a particular variable (e.g., violent video game exposure) is a causal factor for a particular outcome (e.g., aggressive behavior).

The three major types of studies are experimental, cross-sectional correlational, and longitudinal studies. Experimental studies randomly assign participants to different groups: for example, playing either a violent or non-violent video game. A major result of random assignment is that individual differences among the participants should be equally distributed between the groups, creating groups that are equivalent (more or less) at the outset—even on individual differences that have not been measured. The experimenter measures the outcome variable after the experimental manipulation takes place. If the groups differ

on the outcome variable, the researcher can conclude with confidence that the manipulated variable caused the obtained difference in outcome. This is the great strength of experimental studies. The major weakness is that one frequently cannot use strong real-world measures of the conceptual outcome variable. For example, it would be unethical to actually allow study participants to physically ~~beat~~ hit each other; therefore, more ethical measures must be used. In such cases, researchers use ethically appropriate measures that faithfully represent the conceptual outcome variable. Ideally, though not necessarily, one would use measures that also predict or are predicted by more extreme real-world measures. For example, the competitive reaction time task frequently used to measure physical aggression in the lab has repeatedly shown high external validity such.

Cross-sectional correlational studies allow researchers to get beyond the outcome variable limitation of experimental studies. In a cross-sectional study, for example, researchers might survey children about the video games they play and about several real-world types of aggressive behavior, such as how many physical fights they have had. The major weakness of cross-sectional studies is that claims of causality are more risky, especially from a single study. For example, it might be that playing violent games causes aggressive behavior, or that aggressive children are more likely to play violent games, or that some third variable causes both (such as poor impulse control). Cross-sectional studies are strong where experimental studies are weak and vice versa. According to the triangulation notion, if both types of studies show similar results, researchers can be reasonably comfortable in assuming that they have discovered a real causal effect on important, real outcomes. And of course, many plausible alternative explanations can be tested using cross-sectional designs.

Longitudinal studies document changes over a longer period of time. For example, one might measure children's video game habits and their aggressive behaviors at two points in time separated by 6 months. One can then test whether children who play violent games at the beginning of the study *change* to become relatively more aggressive by the end of the study. This design, when used properly, allows some causal conclusions and use of real world outcome variables. The major limitations of longitudinal studies are that they are difficult and expensive.

The strongest case for establishing that a hypothesized effect is causal arises when the same conceptual results are obtained regardless of the research design—and when plausible alternative explanations have been tested and ruled out. In the video game domain, such variables might include sex, personality trait hostility, parental education level, and parental monitoring of media, among others. Experimental studies by their very nature control for such individual difference variables, even if the variables haven't been measured. So do longitudinal studies, at least to some extent. Cross-sectional studies have no inherent control for such potential confounds, but if such variables are measured, then they can be statistically controlled.

Scientific Causality, Risk, and Resilience

It is important to note what scientifically-established causality means and does not mean, as this often creates confusion for the public. Modern scientific causality is not the "necessary and sufficient" causality of old. Instead, it is probabilistic. For example, "smoking causes lung cancer" means that repeated smoking of tobacco products increases the likelihood that one will contract lung cancer. It does not mean that all smokers get lung cancer or that only smokers get it. Similarly, "media violence causes aggression" means that exposure to violent media increases the likelihood of later aggressive behavior. It does not mean that all violent game players will behave aggressively, or that only violent game players behave aggressively. The probabilistic nature of modern causality results from the fact that human health and behavior is multicausal. This approach to understanding the multicausality of behavior is sometimes known as *the risk and resilience approach* (Gentile & Sesma, 2003).

Years of study have documented scores of variables that individually increase the likelihood of concurrent or future aggression. These include variables at many different levels of

analysis, including poverty, having been bullied, taking drugs, genetic risk for aggression, poor parenting, and media violence (Surgeon General, 2001). Each of these individually is a risk factor for aggression—that is, each increases the risk of current or future aggressive behavior. But no single factor alone is sufficient to elicit more extreme forms of aggression. This does not mean that we can ignore any of them—each is important, and steps could be taken to minimize them.

In addition, there are factors that help lower the risk of aggression: These are *protective factors*. These also include variables at many different levels of analysis (e.g., having prosocial peers, having highly involved parents, being female, and certain genetic/biological factors). To predict and understand which people will behave aggressively, therefore, we need to understand the risk and protective factors that each individual has. Each additional risk factor increases the risk, whereas each protective factor decreases the risk. Not every risk and protective factor has the same effect size; some are more important than others (Anderson et al., 2003; Surgeon General, 2001). Furthermore, some risk factors may interact, increasing their effects more together than they would individually, although much more research is needed in this area. Ultimately, it is important to understand that when scientific psychological research documents a causal effect of violent games on aggression, for example, this means that violent games are one risk factor increasing the likelihood of aggressive behaviors, not that they are the only cause of aggressive behavior. In order for a child to behave seriously violently, he or she would need to have multiple risk factors and few protective factors (Gentile & Sesma, 2003).

Violent Video Game Effects

Much research over several decades has documented how witnessing violence and aggression leads to a range of negative outcomes for children. Negative outcomes result both from witnessing real violence (e.g., Osofsky, 1995) as well as from viewing media violence (Anderson et al., 2003; Gentile, 2003). Unfortunately, many parents who take great pains to keep children from witnessing real violence in the home and neighborhood often do little to keep them from viewing large quantities of violence on television, in movies, and in video games. This lack of parental concern about media violence is perplexing given the research on its harmful effects, the large number of national reviews of the research that have publicized these effects, and the strong critique of media violence by pediatricians. We do not mean to suggest that there is no controversy over how to interpret the results of studies. What appear to us to be overreactions happen in both directions, from some people claiming that violent games are training a generation of killers to others claiming there is no effect at all. For example, attorney (now disbarred) Jack Thompson stated on ABC's *World News Now* program (March 23, 2000): "In every school shooting, we find that kids who pull the trigger are video gamers." On the other extreme, psychologist Christopher Ferguson claimed that the existing research is largely "pseudoscience" (2009) and that researchers are attempting to create a "moral panic" (2008; 2010). Neither of these claims seems reasonable to us. The most recent comprehensive review of the overall media violence literature (including television, movies, and video games) documents the ". . . unequivocal evidence that media violence increases the likelihood of aggressive and violent behavior in both immediate and long-term contexts" (Anderson et al., 2003, p. 81). Interestingly, a 2004 survey of pediatricians found that over 98% believed that the media affect childhood aggression (Gentile et al., 2004). But somehow this message has not been convincingly delivered to, or always understood by, average Americans (Dill, 2009a).

A Recent Meta-Analysis

In this section, we review the available research on the effects of playing violent video games. Six outcome variables have received sufficient research attention to warrant inclusion in a recent comprehensive meta-analytic review: aggressive behavior, aggressive cognition, aggressive affect,

physiological arousal, prosocial behavior, desensitization/low empathy (Anderson et al., 2010). This meta-analysis is considerably larger than any prior meta-analysis of the violent video game effects literature (e.g., Anderson, 2004; Anderson & Bushman, 2001) for two primary reasons: (1) It included a large number of previously unavailable studies from Japan; and (2) there has been an explosive growth in research on this topic in recent years. Specifically, 381 effect sizes were obtained from 136 research reports involving over 130,000 participants. In the following sections, all reported meta-analytic results are from this new meta-analysis, and all are based on the sample of studies that met all best practices criteria (the "Best Raw" sample in Anderson et al., 2010). This sample included 221 effect sizes involving over 61,000 participants.[1]

Main Findings

The main findings can be succinctly summarized: Playing violent video games causes an increase in the likelihood of physically aggressive behavior, aggressive thinking, aggressive affect, physiological arousal, and desensitization/low empathy. It also decreases helpful or prosocial behavior. With the exception of physiological arousal (for which there are no cross-sectional or longitudinal studies), all of the outcome variables showed the same effects in experimental, cross-sectional, and longitudinal studies. The main effects occurred for both males and females, for participants from low-violence collectivistic type Eastern countries (e.g., Japan), and from high-violence individualistic type Western countries (e.g., United States, Europe). Table 13.1 displays the major findings of the meta-analyses.

Table 13.1 Average effect size of violent video game play. (Results from the "Best Raw" data, Anderson et al., 2010.)

Design	*Total N*	*K*	*Ave. Effect (r+)*	*Z*
Physical Aggression				
Experimental	2513	27	.210	10.512**
Longitudinal	4526	12	.203	13.787**
Cross-Sectional	14,642	40	.262	32.291**
Aggressive Cognition				
Experimental	2887	24	.217	11.695**
Longitudinal	3408	8	.115	6.728**
Cross-Sectional	9976	27	.183	18.445**
Aggressive Affect				
Experimental	1454	21	.294	11.289**
Longitudinal	2602	5	.075	3.836**

(Continued)

[1]Note that the other two samples—the Full Sample (N = 130,296) and the Best Partials Sample (N = 53,034)—yielded essentially the same results. That is, in each sample, the average violent video game effect sizes were significant.

Table 13.1 (Continued)

Design	*Total N*	*K*	*Ave. Effect (r+)*	*Z*
Cross-Sectional	5135	11	.101	7.227**
Prosocial (helping) Behavior				
Experimental	633	4	–.182	–4.599**
Longitudinal	2778	5	–.114	–6.022**
Cross-Sectional	3495	7	–.093	–5.506**
Empathy/Desensitization				
Experimental	249	1	–.138	–2.175*
Longitudinal	2421	4	–.184	–9.147**
Cross-Sectional	3910	10	–.203	–12.845**

Notes: Total N is the total number of participants in all of the summarized studies. K is the number of different studies. The Average effect (r+) is the weighted average effect size, expressed as an r-value. Z is the Z-test of whether the effect is significantly different from zero.

* $p < .05$. ** $p < .001$.

Additional Findings

From a triangulation perspective, the results of the meta-analysis seem clear. There is strong evidence that playing violent video games increases aggression and affects a host of relevant outcome variables in theoretically expected ways. The violent game effect occurs in both the immediate situation (experimental studies) and across time (cross-sectional and longitudinal studies). The triangulation notion applies not only to using multiple research designs, but to using multiple methods and participant populations within each design. The findings were quite consistent in these ways as well, showing that the main findings held across culture, age, and sex. The range of measures used in these studies was also impressive. For example, physical aggression measures included standard laboratory measures, self-reports of fights at school, peer reports, teacher reports, and reports of truly violent behavior.

Overall, the basic question of whether violent games are a potential risk factor for increased aggressive thoughts, feelings, and behaviors appears to have been answered. Research is beginning to move into potentially more interesting questions, such as whether some children are more vulnerable to the effects than others. Markey and Markey (2010), for example, provide data suggesting that children with certain personality features (e.g., high neuroticism, low agreeableness, and low conscientiousness) may be the most vulnerable to violent game effects. Although other studies have not found a profile that strongly suggests increased vulnerability for some groups (e.g., boys, highly aggressive individuals, etc.), this is a promising area of research.

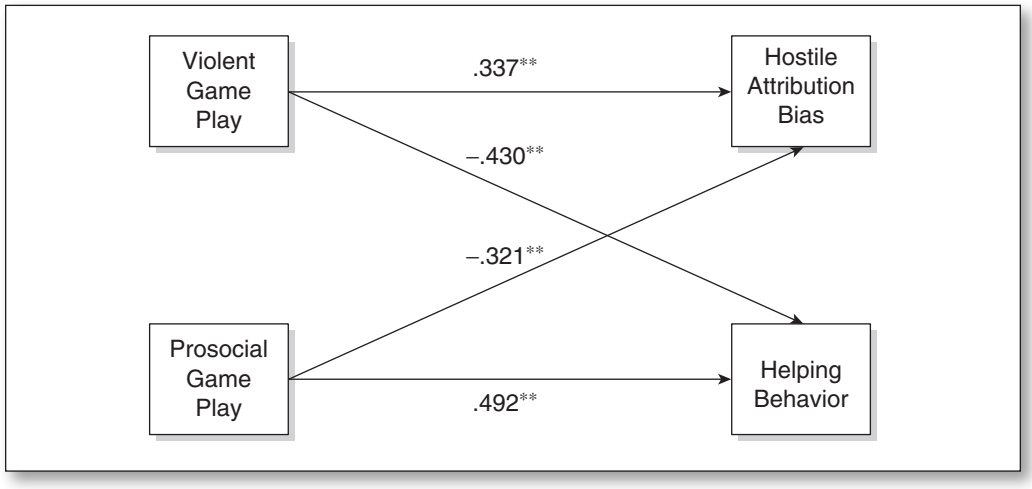
Prosocial Video Game Effects

There has been little research on the effects of prosocial, nonviolent video games. There are few nonviolent games that have lots of prosocial content—that is, games in which the main character's primary task is to help other game characters in nonviolent ways. Although some might argue that games in which the player's character is a hero killing "bad guys" and saving other "good" characters are prosocial, the large research literature on TV and film violence effects clearly demonstrates that such heroic violence increases later aggression,

not helping behaviors. The paucity of studies of wholly prosocial video games is at least partly the result of a lack of appropriate games. Nonetheless, there have been a few recent studies.

Gentile et al. (2009) reported three studies, one of each design type. The experimental study had American elementary school students play certain scenes from a randomly assigned children's game with prosocial nonviolent content (*Chibo Robo, Super Mario Sunshine*), violent content (*Ty2, Crash Twinsanity*), or nonviolent nonsocial content (*Pure Pinball, Super Monkeyball Deluxe*). Later, they were each given an opportunity to help or to hurt another child's chances of winning a gift certificate. Those who had played one of the prosocial games were significantly more helpful than those in the violent or nonsocial conditions. The longitudinal study assessed the video game habits and prosocial behavior of a large sample of Japanese 5th, 8th, and 11th graders at two points in time about 3 to 4 months apart. A maximum likelihood model revealed that exposure to prosocial video games at Time 1 led to a relative increase in prosocial behavior at Time 2, even after controlling for prosocial behavior at Time 1. The cross-sectional study assessed the video game habits of a large sample of Singaporean secondary school children, along with several prosocial measures. After statistically controlling for sex, age, and violent game play, amount of prosocial game play was positively related to helping behavior, cooperation and sharing, and empathy. Interestingly, amount of violent game play was positively related to hostile attribution bias, and negatively related to helping behavior. Figure 13.3 displays some of the key results.

Figure 13.3 Effects of prosocial and violent video game play on helping behavior and hostile attribution bias. Based on data from Study 1, Gentile et al., 2009



Similar research by Greitemeyer and Osswald (2009) reported two experiments in which brief play of a prosocial video game led to a decrease in both hostile expectation bias and in accessibility of antisocial thoughts. In sum, the tiny research literature on prosocial game effects mirrors the huge literature on violent game effects, supporting the idea that the same basic social-cognitive processes underlie both phenomena.

Video Game Character Portrayals and Effects

There is a growing body of research on video game character portrayals and the effects of exposure to these representations. Theoretically, these studies—primarily content analyses and experiments—dovetail with the violent video game effects research because they

have focused on portrayals of aggression and related themes such as power, dominance, objectification, and degradation. What is perhaps most substantively interesting about this work is that it is, in essence, a social psychological analysis of how stereotyping and prejudice relate to aggression. For example, this research has begun to analyze discrimination toward stereotyped group members (e.g., sexual harassment of women) as an aggressive outcome measure, which is distinct from the way aggression is measured in most previous video game violence effects studies (Dill, 2009a).

Content Analyses of Video Games

Gender

Content analyses of gender have found that white, male adults are the most common and most central game characters; women and nonwhites are underrepresented and often stereotyped (Beasley & Standley, 2002; Burgess, Stermer, & Burgess, 2007; Dill, Gentile, Richter, & Dill, 2005; Dill & Thill, 2007; Scharrer, 2004; Williams, Martins, Consalvo, & Ivory, 2009). This is true regardless of whether the source of content studied included game play, cover art, magazine articles, advertisements, or print or digital and Internet images. Male characters are commonly depicted as hypermasculine, powerful, dominant, muscular, and aggressive, whereas female characters are commonly portrayed as hypersexual (with an emphasis on breasts), scantily clad, thin, and attractive and are objectified (Beasley & Standley, 2002; Dill & Thill, 2007; Jansz & Martis, 2007; Miller & Summers, 2007; Robinson, Callister, Clark, & Phillips, 2008; Scharrer, 2004). For example, in a content analysis of popular video game websites, males outnumbered females 3 to 1, 80% of female characters were depicted as thin or very thin, and about a third of female characters had voluptuous breasts (Robinson et al., 2008).

In a related study (Dill & Thill, 2007, Study 2), researchers asked young men and women to describe their schemas for typical male and female video game characters. Results mirrored previous content analytic findings. Schemas for male video game characters focused on aggression, power, and dominance, whereas schemas for female video game characters focused on sexualization, attractiveness, the thin, busty body type, and to a lesser extent on aggressiveness.

Exposure to the vision of women as sex objects activates what has been called the "whore" (Rudman & Borgida, 1995) or "vamp" (Fox & Bailenson, 2009) schema, which increases negative attitudes toward women and Rape Myth Acceptance, whereas exposure to nonstereotypical female avatars does not (Fox & Bailenson, 2009). Interestingly, in addition to being sexualized, research has shown that female game characters are also more likely to be depicted as helpless, needing rescue, and innocent (Dietz, 1998; Miller & Summers, 2007). This dichotomy actually conforms to the predictions of Ambivalent Sexism Theory (Fiske & Glick, 1995; Glick & Fiske, 1996, 2001), which proposes that stereotypes about women incite two categories: benevolent sexism (e.g., the helpless woman) or hostile sexism (e.g., the vamp).

Experimental Studies on Gender in Games

Two studies measured the effects of exposure to sexually objectified female video game avatars and sexual harassment of women. In one study (Yao, Mahood, & Linz, 2010), males played either a video game that sexually objectified women (*Leisure Suite Larry: Magna Cum Laude*) or a control game (*The Sims*). Males exposed to the sexually objectified women self-reported a greater likelihood to sexually harass women and a greater accessibility of a women-as-sex-object schema compared to controls.

In another study, Dill and colleagues (Dill, Brown, & Collins, 2008) found that men, but not women, exposed to sex-typed female (sexualized) and male (aggressive) video game characters made more lenient judgments toward a perpetrator in a real-life case of sexual harassment and advocated more lenient punishment of the perpetrator than did controls who had seen non-objectified females and males. The men who saw the sex-typed characters also felt less sorry for the female victim of sexual harassment and tended to blame the victim to a greater extent than control participants. Similarly, Dill (2009b) found

that violent video game play is positively correlated with Rape Myth Acceptance and negative attitudes toward women.

When asked their opinion about the harmfulness of sexualized and aggressive game content, women are more likely than men to think sex-stereotypical and violent content is inappropriate. Men and frequent-gamers are less likely to think game content influences behavior and more likely to categorize negative content as "just harmless entertainment" (Brenick, Henning, Killen, O'Connor, & Collins, 2007).

Race and the Race/Gender Intersection

Women and non-whites (blacks, Asians, Latinos, Native Americans) are underrepresented in video games, sending the message that members of these groups are viewed as less important and powerful than white males (Burgess, Dill, Stermer, Burgess, & Brown, in press; Williams et al., 2009). Women of color are almost invisible in video games (Burgess et al., in press). In a content analysis of gender and race in video games, Dunlop (2007) found that characters of color were rare and that few to no characters of color were playable avatars; rather, they were agents controlled by computer algorithms. Furthermore, both Dunlop (2007) and Burgess and colleagues (in press) found that black male characters were often represented as either street criminals and thugs or athletes. Burgess and colleagues also found that black male characters were underrepresented as engaging in military or justified violence.

Middle Eastern men have been portrayed disproportionately as targets of violence and have been portrayed by European and American game designers as terrorists specifically and as "the enemy" and "the other" generally (Dill et al., 2005; Sisler, 2008). However, the exception to this rule comes from the serious games movement and from emerging Middle Eastern game makers attempting to introduce "digital dignity" into Arab representations (Sisler, 2008).

Character Aggression

Research indicates that the aggression carried out by video game characters is usually portrayed as justified, retributional, necessary to complete the game, rewarded, and followed by unrealistic consequences (Dietz, 1998; Dill et al., 2005; Haninger, Ryan, & Thompson, 2004; Lachlan, Smith, & Tamborini, 2005; Robinson et al., 2008; Smith, Lachlan, & Tamborini, 2003; Smith et al., 2004). The overall level and realism of violent depictions, the use of guns, and the likelihood of being killed by a gun has risen substantially in games over time. In addition, female victims and police officer victims have risen significantly across time (Miller, 2009).

Avatars and Agents

As avatars have become more diverse and common, and as technological capabilities have improved, research has appeared that details the psychological ramifications of avatar and agent exposure and manipulation. Avatars and agents can appear in games as well as other venues, such as virtual worlds like Second Life. Yee and Bailenson (2007) labeled the effect of avatar characteristics on the player as the *Proteus effect*. Research on the Proteus effect has found that playing characters wearing black or aggressive clothing primes aggression, resulting in greater aggressive behaviors in-game (Peña, Hancock, & Merola, 2009; Yee & Bailenson, 2007). Furthermore, Fischer, Kastenmuller, and Greitemeyer (2010) found that playing a violent video game with a personalized avatar increased aggression, arousal, and self-activation in players. These results are consonant with findings that identification with game characters enhances imitation (Konijn, Bijvank, & Bushman, 2007).

Avatar attractiveness also influences players' related thoughts and feelings. According to some research, playing as an attractive avatar increases in-game social competence (Yee & Bailenson, 2007). Other research (Barlett & Harris, 2008; Chandler, Konrath, & Schwarz, 2009), however, has indicated that playing as an avatar with an idealized figure increases negative self-thoughts. For example, Barlett and Harris (2008) assigned male and female participants to play a video game with an avatar with an idealized figure. For males, this was a hypermuscular wrestler, for females, a hypersexual beach volleyball player. After

playing as the idealized avatar, both male and female players felt significantly worse about their bodies.

Finally, avatar experiences can influence the person's behavior, thoughts, and feelings while in-game or in-world, but they also can carry over to real life. For example, Cabiria (2008) found that gay and lesbian people improved negative identity issues by coming out or seeking authentic connections with other gay and lesbian avatars in Second Life. Furthermore, these in-world experiences often translated to more authentic and positive experiences with gay and lesbian identity in real life.

Video Game Addiction

Many researchers have begun studying the concept of video game addiction, often defined by dysfunctional tendencies surrounding video games, computers, and the Internet. Although there is still considerable debate about how to define it (Shaffer, Hall, & Vander Bilt, 2000; Shaffer & Kidman, 2003; Shaffer et al., 2004), most researchers studying the pathological use of computer or video games have defined it similarly to how pathological gambling is defined—based on damage to family, social, school, occupational, and psychological functioning. Scientific studies using DSM-style criteria to investigate pathological computer or video gaming were first reported in the mid-1990s (Fisher, 1994; Griffiths & Dancaster, 1995; Griffiths & Hunt, 1998); the pace of studies has increased greatly in the past decade. Overall, the studies demonstrate good reliability and validity. That is, the construct of video game addiction can be measured reliably, and people who would be classified as pathological or addicted also demonstrate the patterns of problems and comorbid disorders that we would expect if it was similar to other addictions.

There currently is no medical diagnosis for video game\computer\Internet addiction in the United States. In 2007, the American Medical Association (AMA) released a report on the "addictive potential" of video games (American Medical Association [AMA], 2007). The report concluded with a recommendation that the "AMA strongly encourage the consideration and inclusion of 'Internet/video game addiction' as a formal diagnostic disorder in the upcoming revision of the *Diagnostic and Statistical Manual of Mental Disorders*-IV" (p. 7). The American Psychiatric Association, which drafts diagnostic criteria for the DSM-V, added a new category of "behavioral addictions," but gambling will initially be the sole disorder. Internet addiction was considered for this category, but work group members decided there was insufficient research data to include it. Instead, they recommended that it be included in the manual's appendix, with the goal of encouraging additional study of Internet/video game addictions (American Psychiatric Association, 2005). New studies are needed to document how large a problem this is, who is most at risk, the etiology of the disorder, how long it lasts, what the outcomes are, whether treatment is needed, and what types of treatment are most effective before it would be accepted as a recognized mental health disorder.

Studies have begun working on this list. At the time of this writing, several studies in several countries have begun documenting the prevalence of people who are at a dysfunctional level. The most comprehensive study to date in the United States used a national sample of over 1,100 youth aged 8 to 18, in which 8.5% of video game players were classified as pathological (Gentile, 2009). In Europe, 11.9% of 7,069 computer gamers fulfilled the diagnostic criteria of computer game addiction (Grüsser, Thalemann, & Griffiths, 2007). A Norwegian study involving 3,237 adolescents between 12 and18 years of age reported the pathological Internet use rate to be 4%, with an additional 18% showing at-risk use (Johansson & Götestam, 2004a). In the same sample, the prevalence of pathological video game use among video game players was 4%, with an additional 15.5% showing at-risk use (Johansson & Götestam, 2004b). A Chinese study reported a prevalence rate of 10.32% among 503 college students in mainland China (Peng & Li, 2009). In Taiwan, 7.5% of the 517 adolescents in a study were classified as "Internet addicts" (Ko, Yen, Yen, Lin, & Yang, 2007),

among whom 42.9% played games online. Among 2,998 Singaporean children, 8.7% met the criteria for pathological video gaming (Choo et al., in press). The percentage of youth who could be considered to be addicted seems remarkably similar across cultures, demonstrating that (1) this is not a problem that is specific to one country, and (2) it is not a trivial number of people who are suffering damage to their lives because of their game play. More research in this area is clearly warranted.

School Performance

Several studies have documented a negative relation between amount of time playing video games and school performance among children, adolescents, and college students (Anderson & Dill, 2000; Anderson et al., 2007; Chan & Rabinowitz, 2006; Chiu, Lee, & Huang, 2004; Cordes & Miller, 2000; Gentile, 2009; Gentile, Lynch, Linder, & Walsh, 2004; Harris & Williams, 1985; Roberts, Foehr, Rideout, & Brodie, 1999; Sharif & Sargent, 2006). The displacement hypothesis, which states that games displace time on other activities, is the most typical explanation for this relation. It could be argued, however, that the relation might be due to the children themselves, rather than to game time. It is highly likely that children who perform more poorly at school are likely to spend more time playing games, where they may feel a sense of mastery that eludes them at school. Nevertheless, each hour a child spends playing entertainment games (in contrast to educational games, which have been demonstrated to have educational benefits) is an hour not spent on homework, reading, exploring, creating, or other things that might have more educational benefit. Some evidence has been found to support the displacement hypothesis. In one nationally representative U.S. sample of 1,491 youth between the ages of 10 and 19, gamers spent 30% less time reading and 34% less time doing homework (Cummings & Vandewater, 2007).Therefore, even if poor school performance tends to cause increases in time playing video games, large amounts of video game play are likely to further hurt school performance.

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Visual-Spatial Skills

As mentioned earlier, a number of cross-sectional (e.g., Green & Bavelier, 2003) and a few experimental studies (e.g., Okagaki & Frensch, 1994) have found positive associations between video game play and a wide array of visual/spatial skills. Basically, games that require the player to practice extracting spatial information from the screen appear to improve that specific skill. Furthermore, other tasks that require that practiced skill appear to benefit from the practice. (For a review of this area, see Bailey, West, & Anderson, ~~in press~~.) For example, Gopher, Weil, and Bareket (1994) compared the flight performance of Israeli Air Force cadets who had been trained on *Space Fortress II* and an untrained group. They found that trained cadets performed better in almost all aspects of flight performance, resulting in the military adopting the game as a part of its training program. Many (but not all) of these studies used the fast-paced violent games known to increase aggression, thereby demonstrating the point that the same game can produce many types of effects, some of which are generally thought to be positive (e.g., improved visuospatial skills) and others which are generally seen as negative (increased aggression).

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Executive Function, Cognitive Control, And Attention Deficits

Although the enhanced visuospatial skills discussed in the previous section have sometimes been misinterpreted—especially by the video game industry and the popular press—to promote the claim that violent video games improve attention in general, an emerging line of research suggests very different conclusions. A number of studies have found a positive association between amount of time using screen media (TV, video games) and various types of attention deficits (for reviews, see Bailey et al., ~~in press~~; Swing, Gentile, Anderson, & Walsh, ~~in press~~).

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Several studies have reported that the amount of video game experience is positively correlated with attention deficits, impulsivity, and hyperactivity. For example, Gentile (2009) observed that adolescents reporting pathological video game consumption (about 8.5% of the sample) were 2.77 times more likely to be diagnosed with Attention Deficit Disorder or Attention Deficit Hyperactivity Disorder than were adolescents who reported nonpathological video game consumption. Similar findings have been reported for TV consumption for over a decade (e.g., Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Levine & Waite, 2000), leading the American Academy of Pediatrics to recommend that parents dramatically reduce children's screen time.

Recently, the first longitudinal study to specifically test the effects of video game use (Swing et al., ~~in press~~ 2010) found that even after statistically controlling for the effect of TV exposure, earlier attention problems, and gender, the amount of time spent playing video games by elementary school children predicted increases in teacher-assessed attention problems 13 months later. This study provides the strongest evidence to date that the association between video game play and attention problems is causal, not coincidental. The study also found that the effect of video game play on attention problems was stronger than the effect of TV viewing. What this study did not do, however, was distinguish between different types of video games. There are theoretical reasons to believe that slower paced games that require more controlled thought and planning (whether violent or not), and that some types of fast paced games that require high use of proactive control (e.g., *Rock Band, Guitar Hero*), may not have the same harmful effects as fast paced action games that require primarily reactive action by the player. Such findings have occurred in the TV literature.

A number of studies have examined the relation between video game experience and cognitive control using various versions of the Stroop interference task. In the original version of the Stroop task, participants were shown a series of words one at a time, presented in various colors, with instructions to name the color. Some of the words were color words (*red*). On some trials, a color word was presented in the same color (e.g., the word *red* printed in red), whereas on other trials it was presented in a different color (e.g., *red* printed in green). In general, naming the color is easier (faster) when a color word appears in the same color, and harder (slower) when it appears in a different color. Many variants of this task have been used for decades to assess various types of cognitive control.

Kronenberger et al. (2005) found that adolescents who spend a lot of time watching violent TV and playing violent video games performed more poorly on the Stroop interference task than those who seldom consumed violent media. The high-violence consumers also scored higher on a measure of ADHD. These two media violence effects remained significant even after total screen media time was statistically controlled, suggesting that there is something unique about violent media that contributes to attention problems. Complementing this finding, a study using fMRI found that high video game players failed to recruit anterior cingulate and lateral prefrontal cortex on incongruent trials during performance of the Stroop task, whereas these brain structures were recruited by low video game players (LVGs) (Mathews et al., 2005). This finding led the authors to suggest that video game experience is associated with a disruption in the ability to engage the cognitive control network (Mathews et al., 2005).

One limitation of these Stroop-based studies is that the task design made it impossible to determine whether there was a general effect of video game experience on cognitive control or whether the influence was limited to one or more specific control processes. Bailey et al. (2010) recently addressed this question using both behavioral (i.e., Stroop performance) and event-related brain potential (ERPs) measures to examine the influence of video game experience on proactive and reactive cognitive control. Proactive control represents a future-oriented form of control that serves to optimize task preparation; reactive control represents a just-in-time form of control that serves to resolve conflict within a trial (Braver, Gray, & Burgess, 2007). Bailey et al. (2010) compared performances of high

versus low or no video gaming male college students.[2] They found that the conflict adaptation effect (a behavioral measure of proactive control) was attenuated (poorer) in high gamers relative to low or no gamers when there was a long delay between trials. Furthermore, this effect was associated with an attenuation of the ERP indicators of medial frontal negativity and frontal slow wave (ERP indices of proactive control) in high gamers. In other words, both behavioral and brain wave indicators showed that the high gamers were poorer at proactive control. In contrast, there was no difference between high and low gamers on either the behavioral or neural indices of reactive control.

On the whole, these findings complement evidence of an association between playing video games and attention deficits/hyperactivity and lead to the suggestion that video game experience may have a selective effect on proactive cognitive control processes that serve to maintain optimal goal-directed information processing. Of course, additional research using experimental and longitudinal designs is required to establish the causal nature of the effect of video game experience on cognitive control.

Exergames

Past research has usually categorized video game use as a sedentary activity, and this accurately reflected the games of the time. Only in recent years have games with physical activity, often called exergames, become available and popular. The exergaming trend has attracted attention from the general public and those interested in improving public health, especially for youth.

Popular exergames include dancing games such as the series of *Dance, Dance Revolution (DDR)* games and Wii's *Just Dance*. Exergames such as *Wii Fit* translate traditional forms of exercise like yoga and aerobics into an interactive format. Some games include cameras or other equipment designed to give direct feedback in response to players' movements, thus supplying operant conditioning and thereby acting as an interactive trainer.

While past studies have consistently found the majority of top-selling games and children's favorite games to be violent (Buchman & Funk, 1996; Dietz, 1998; Dill et al., 2005; Henry J. Kaiser Family Foundation, 2002), there is a positive trend in game content that has recently emerged. In 2009, of the top 10 console or handheld video games sold in the United States, 4 were exergames or movement games (*Wii Sports Resort, Wii Fit, Wii Fit Plus*, and *Wii Play*) (npd.com, 2010). Three games (*Halo 3* and two versions of *Call of Duty*), including the top-selling game, featured violence as the main action. Seven of the top 10 games were E-rated Nintendo games (6 Wii and 1 DS game). All 10 of the current (May, 2010) top 10 best selling games on Amazon.com's "Kids & Family" video games are Nintendo games (7 Wii, 3 DS). Five of those are exergames, with the best selling being the highly rated Wii game *Just Dance*.

Advocacy organizations have also noticed the popularity of physically active video games. Part of the *Serious Games Initiative*, a group called *Games For Health* (gamesforhealth.org) was founded in 2004. At their annual conference, researchers, healthcare professionals, trainers, and others meet to discuss all the ways gaming can improve health. Topics covered include exergaming, biofeedback, training, disease management, and behavior modification. *Games for Health* is affiliated with the Robert Wood Johnson Foundation, which has offered sizable grants to several labs studying applications of gaming to health.

Research on exergames is just appearing and has focused on three main areas: energy expenditure, activity time, and activity preference. Given the recent popular emergence of physically active video games, future research should no longer classify video game play *de facto* as a sedentary activity, but it should categorize game play as either sedentary (such as most traditional violent games) or active, such as exergames like the *Wii Fit.*

[2]Although not specifically selected on the basis of violent game play, it should be noted that high gamers typically spend most of their gaming time playing violent games.

Energy Expenditure

Energy expenditure studies have generally found that exergames can be considered a viable form of exercise, though energy output varies by game and gaming experience. For example, Sell et al. (2008) found that college males who were experienced *DDR* players met the American College of Sports Medicine guidelines for moderate physical activity while playing the game, compared to non-players whose play was considered very light activity. Graf, Pratt, Hester, and Short (2009) found that energy expenditure when playing *DDR* and Wii boxing was similar to moderate-intensity walking. In a study of children in Hong Kong (Mellecker & McManus, 2008), those who played an active game involving walking, running, and jumping showed significantly higher energy expenditure and heart rate compared to baseline and to a less active game.

Activity Time and Preference

Because motivation and enjoyment are important factors in whether and how long people exercise, these variables have been studied in relation to exergaming. Studies have used age groups ranging from children to older adults. Findings indicate that people of a variety of ages prefer exergames to other physical activities such as dancing or using an exercise bike, treadmill, or elliptical trainer (McDonough, 2008; Ni Mhurchu et al., 2008; Rhodes, 2008; Rhodes et al., 2009).

During a 12-week intervention, children given an active video game engaged in more physical activity and less inactive video game play than did control children (Mellecker & McManus, 2008). College students had a positive attitude toward exergames in general and thought of exergaming more as entertainment than as exercise. Furthermore, those with low exercise efficacy thought they would be more likely to exercise with an exergame than to do traditional exercise (Klein & Simmers, 2009).

In a study by Rosenberg et al. (2010), community-dwelling senior citizens showed improvement in subsyndromal depression and health-related quality of life after a 12-week intervention where they played Wii sports. Although at first nervous about learning how to play, the seniors were generally highly satisfied with game playing: They enjoyed the challenge and found the games to be fun.

Conclusions

The recent explosion in research on video game effects has greatly improved our understanding of how this medium affects its consumers. Several conclusions can be drawn. First, there are many different effects of playing video games on the player. Some of these are short-term, whereas others are long-term. Second, the specific effects depend on a host of factors, including the content, structure, and context of the game. Third, the same game can have multiple effects on the same person, some of which may be generally beneficial whereas others may be detrimental. Fourth, playing violent video games is a causal risk factor for a host of detrimental effects in both the short- and the long-term, including increasing the likelihood of physically aggressive behavior.

A number of additional conclusions are less well established, and they require further empirical tests. For example, there is a small literature suggesting that playing video games that are both nonviolent and prosocial can lead to increases in short-term and long-term prosocial behavior, and possibly to decreases in aggressive behavior. Also, there is evidence that games with stereotyped images and storylines increase beliefs and behaviors congruent with the stereotypes. Most of this research has focused on gender and race issues. Furthermore, there is emerging evidence that exergames are more attractive to some users than other forms of exercise, that they can improve physical activity levels, and that they are among the most popular games sold today. Video game (and Internet) addiction appears to be a real phenomenon that affects a ~~large~~ substantial proportion of gamers. Finally, there is growing evidence that high levels of gaming might create or exacerbate certain types of attention problems. Given the large

Note that although the level of energy expenditure by exergames is not generally as high as moderate exercise, it is substantially more than sedantary screen time. Therefore, a positive benefit could be gained by simply substituting active games for other games.

proportion of people who play games, this could have huge repercussions not only for individual lives, but for the economic welfare of modern society.

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