

# Smashing the Screen

## *Violent Video Game Effects*

Ann Lewis, Sara Prot, Christopher L. Groves,  
and Douglas A. Gentile

*Iowa State University*

In 1965, Gordon Moore noted that computer processing power had roughly doubled every two years. He predicted that trend would continue for at least 10 years more (Moore, 1965). It turned out that prediction was much too conservative. In the twenty-first century, our technologies have become ubiquitous, yet are replaced in time spans that would have felt ludicrously short for scientists of 100, 70, or even 30 years ago.

One now-pervasive technology is video games. A far cry from the pixelated *Space Invaders*, or a jumping plumber (who became Italian because a fluffy mustache was the only way to distinguish his nose from his mouth), we have now brought our digitized entertainment to nearly full-immersion alternate-reality experiences. Co-emerging with the increasingly advanced art and storytelling has been the increasingly broad access to video games. Video games have moved from arcades to colonizing our homes and even our bodies, becoming available on the computers on our desks, the consoles in our entertainment centers, the tablets in our bags, and the smart-phones in our pockets.

Video games include varied applications from the educational to the professional to the entertaining. They cover a wide range of genres, and involve a wide spectrum of physical, emotional, and cognitive skill to use them effectively, and to compete with ourselves and others. Worldwide, over half a billion people play video games at least an hour a day (McGonigal, 2010). The average personal time spent gaming has gone up as well (Escobar-Chaves & Anderson, 2008; Gentile & Anderson, 2003; Rideout, Foehr, & Roberts, 2010). The average gamer spends eight hours a week in online play, virtually a part-time job (NPD Group, 2010), and the average young adult racks up 10,000 hours of game-playing by the time they turn 21, a nearly hour-for-hour equivalent to the time spent attending all of middle and high school (McGonigal, 2010). Collectively, we spend three billion hours a week playing video games.

Anything people do, however, has the opportunity to affect them. The violent content of many popular games has engendered particular concern. Of the top 10 most pre-ordered games of 2012, the primary method of game play centered on some form

of combat (Welch, 2012). Five were first-person shooters, while the remaining five were in the more flexible adventure category, often combining their combat with world exploration. The number one most pre-ordered game, *Call of Duty: Black Ops II*, earned half a billion dollars in the first 24 hours following its release, and in less than a month it doubled that (Welch, 2012). *Black Ops II* is the ninth *Call of Duty* game. Across the franchise, players have spent 2.85 million years of collective game time playing (Fung, 2013), and yet *Call of Duty* is just one among many popular games.

We do not mean to vilify a single game, franchise, or producer, or to demonize video games. Although highly publicized violent events, particularly school shootings, have cast a spotlight on violent video game play as a possible contribution, there is no indication that playing a violent video game will turn a gamer from someone logging in to spend some digital time with friends into a mass murderer. But parents often underestimate how much exposure their children are getting to violence while playing video games (Funk, Hagan, & Schimming, 1999), and the violent content is commonly shown as justified, fun, and without negative consequences (Funk, Baldacci, Pasold, & Baumgardner, 2004). Assuming that violent game play is not predictive of mass murders does not mean that there is no reason to be concerned. There are several other effects that are of potential concern.

Repeated behavior, combined with regular rewards of fun and in-game accomplishments, may have a much more subtle effect than creating killers. Many researchers are more concerned with their relation to the types of aggression that children regularly come into contact with: verbal and relational aggression, bullying, and minor physical scuffles. Video games also deliver information on social roles and stereotypes. Some youth also appear to form addictive patterns with games, thereby damaging other areas of their functioning.

This chapter describes a theoretical framework for understanding effects of playing violent video games and then describes the current research covering those effects, including attentional, aggressive, prosocial, achievement, and other social-cognitive aspects.

## Theoretical Frameworks

Nearly 50 years of research confirms that violent content in movies, television shows, and video games can serve as a causal risk factor for aggression (Anderson et al., 2003). However, understanding how this effect occurs and how seriously to take it is a complex task. Numerous theories of aggression exist, each of which provides a unique window of insight. However, when considered individually, each is only able to capture a fraction of the processes involved. For this reason, the general aggression model (GAM; Anderson & Bushman, 2002) was developed to provide an integrative framework through which these domain-specific theories are incorporated.

The general aggression model is considered a biosocial cognitive-developmental model, providing a theoretical framework through which all sources of aggressive behavior can be explained. Some of the influential theories that GAM incorporates include cognitive neo-association theory (Berkowitz, 1990, 1993), social learning theory (Bandura, 1977), script theory (Abelson, 1981; Huesmann, 1988), excitation transfer theory (Zillmann, 1971), and social interaction theory (Tedeschi & Felson, 1994).

Each of these theories is incorporated into both proximate and distal processes elucidated by GAM. Short-term processes are described by GAM's single episode cycle (see Figure 28.1), which begins with two forms of input. The first of these inputs consists of personal variables, which include personality constructs such as trait hostility and biological tendencies such as genetic dispositions toward aggression or high testosterone. These variables typically endure across situational episodes, but they also include the current state of the individual, such as mood or arousal. The second form of input is the situation itself, which may involve provocation, high temperatures, or exposure to content that primes aggression.

In the next stage of GAM's single episode cycle, these inputs influence several levels of the individual's internal state, including affect, cognition, and physiological arousal. Importantly, these three states both influence and are influenced by each other. For example, when aggressive cognitions are highly salient, individuals may begin to feel angry and experience increases in heart rate associated with anger. These internal state variables then inform decision-making processes when selecting a behavioral reaction. Decision-making can either be consciously deliberate and controlled (i.e., a thoughtful action) or impulsive and largely automatic. Once a behavior has been executed, it in turn influences the situation, which feeds into the next behavioral cycle.

Note that the single episode cycle most directly speaks to aggressive outcomes occurring within a given moment. However, it should also be noted that each social encounter can influence distal processes, such as learning about consequences or changes in the individual's predispositions to react aggressively. For example, when playing violent video games, aggression-related knowledge structures are learned, rehearsed, and reinforced. This leads to long-term changes in aggressive beliefs and

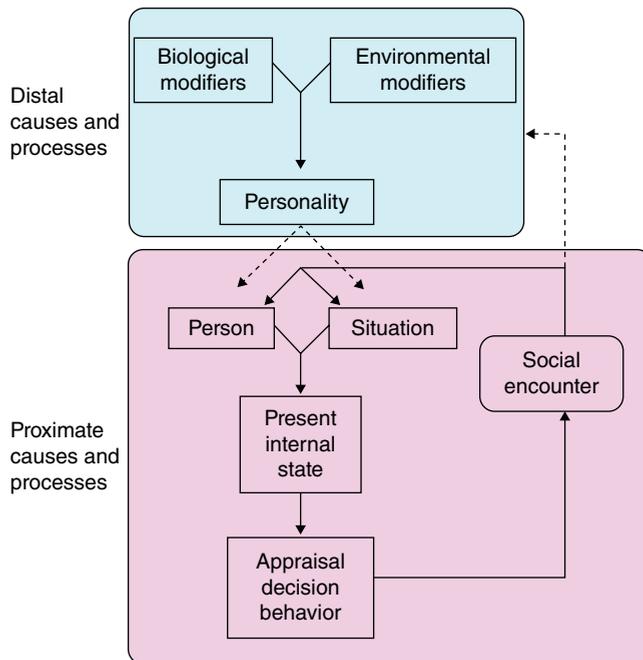


Figure 28.1 Single cycle within the general aggression model.

attitudes (Bryant, Carveth, & Brown, 1981; Crick & Dodge, 1994; Dodge, 2010), aggressive perceptual and expectation schemata (Dill, Anderson, Anderson, & Deuser, 1997; Moller & Krahé, 2009), aggression-related scripts (Huesmann, 1988), and desensitization to aggression and violence (Carnagey, Anderson, & Bushman, 2007; Mullin & Linz, 1995). In essence, what develop are the underlying psychological aspects that together influence aggressive personality, which in turn influences the types of situations that the individual may experience in the future.

Although violence in media has been the most heavily studied form of content, one should note that some video games clearly possess content that is not violent but also can influence thoughts, feelings, and behavior. For example, playing video games containing prosocial content leads players to increase helping behavior outside of the video game context (Greitemeyer & Osswald, 2010). For this reason, learning theories are best applied to understand the wider range of effects that video games can have beyond aggression. Similar to aggression, however, the literature devoted to learning is often fragmented into different levels of analysis, focusing on specific learning processes such as habituation, discrimination, classical conditioning, operant conditioning, observational learning, and cognitive and emotional learning. Although learning from games (or anything) can occur at each of these levels, they have also been integrated recently into a general learning model (Buckley & Anderson, 2006; Gentile, Groves, & Gentile, 2014). It is valuable to remember that basically every effect that video games can have on players is due to learning. People can learn from a single exposure to something, but they learn it especially well with repetition and rewards, both of which video games provide well.

Finally, although the general aggression model is widely accepted as an explanation of general learning processes in media-influenced aggression, additional processes may be involved. These include desensitization to violence, priming of aggressive thoughts, the development of aggressive scripts, excitation transfer, the modification of normative beliefs about aggression, and the reinforcement of hostile attribution biases. Groves, Prot, and Anderson (in press) discuss each of these processes in further detail and we encourage readers to visit this work for a more detailed theoretical account of such effects.

## **Empirical Findings**

### **Aggressive Cognitions, Affect, and Behavior**

Anderson et al. (2010) conducted a meta-analytic review of more than 130 studies in Western and Japanese sources published through 2008. They coded the material by methodology, participant characteristics, aggressive measure type, and game content, including whether the protagonist was a hero, criminal, or neither, and whether the violence targets were human, non-human, or both in experimental studies. Across the 130 studies reviewed, violent video game exposure was associated with an increase in both short-term and long-term aggressive cognition. Some interaction was found in culture and sex in some types of studies, although culture was confounded by type of measure involved.

This meta-analysis was an update to an earlier review by the same lead researcher. Both studies concluded that exposure to violent video games increased short-term and long-term aggressive thinking, aggressive feelings, and aggressive behavior.

Anderson and Bushman (2001) noted that the relationship between violent video game exposure and aggressive behavior was as strong as the relationship between condom use and HIV infection. Interestingly, several other meta-analyses have been conducted, and all of them find essentially the same empirical finding (an average significant effect size between 0.14 and 0.29) (Anderson, 2004; Anderson et al., 2004), but not all authors interpret it as important (Ferguson, 2007a, 2007b; Sherry, 2001). Although there is honest disagreement among researchers about whether an effect size of this magnitude is of practical significance, perhaps some of the difference in interpretation is due to the importance some researchers put on moderating factors. Several aspects of both games and gamers have been shown to either enhance or mitigate the effects of violent content.

Intent to commit aggressive actions within a game necessitates the activation of aggressive thoughts. However, the content of the game may influence the deliberative level of that intention. Subjects who played a game that rewarded violence displayed more hostile emotion, thinking, and behavior, while a game that punished violence resulted in more hostile emotion, but not thinking or behavior (Carnagey & Anderson, 2005). The level of player immersion or involvement in a game may also have an effect. For example, in one study aggressive behavior increased more in boys who played a violent video game compared to boys who just watched it being played (Polman, Orobio de Castro, & van Aken, 2008). Players who used a personalized character also exhibited increased aggression compared to those who used pre-programmed characters, although any violent game player was still subsequently more aggressive than those in the non-violent condition (Fischer, Kastenmüller, & Greitemeyer, 2010).

The greatest concern regarding video game play and real-life aggression may be in the long-term internalization of aggressive attitudes and desensitization to violence. Experienced players report less moral distress after playing violent games than inexperienced players do (Gollwitzer & Melzer, 2012). Players who self-reported more violent game play also demonstrated higher aggressive self-concept, and participants who played the violent video game *Doom* in an experimental context were faster to associate themselves with aggressive concepts than participants who played a non-violent game (Uhlmann & Swanson, 2004). Further, players who report higher levels of identification with violent characters are more aggressive after playing those games (Konijn, Nije Bijvank, & Bushman, 2007).

Ultimately, the research on violent video games and aggression fits very well within modern multi-causal theories of aggression, where media violence is considered just one among many risk factors for aggression (e.g., Gentile & Bushman, 2012). It is clearly not the largest; neither is it the smallest. This approach is useful for understanding why most people can play violent games and still not be particularly aggressive in their daily lives – aggression typically requires a confluence of multiple risk factors and very few protective factors. Within this framework, violent video games are simply one relatively small risk among many.

### Empathy, Desensitization, and Helping

Most children initially respond to media violence with fear, disgust, and heightened arousal (Cantor, 1998). However, such aversive reactions gradually decrease with repeated exposure to violent images. Media violence consumers become desensitized

not only to media images themselves but also to real-life violence (Mullin & Linz, 1995). There is research evidence of both short-term and long-term desensitization as a result of violent video game play. For example, even a brief, 20-minute episode of violent video game play can lead to reduced physiological responding to real-life violence (Carnagey et al., 2007). Such short-term desensitization dissipates quickly (Mullin & Linz, 1995). However, habitual media violence consumption can lead to more lasting effects. Several studies show evidence of chronic desensitization to violence through video game play (Bailey, West, & Anderson, 2011; Engelhardt, Bartholow, Kerr, & Bushman, 2011; Krahe et al., 2011). Habitual violent game players have reduced neural responses while viewing violent images (Bartholow, Bushman, & Sestir, 2006; Gentile, Swing, Anderson, Rinker, & Thomas, 2014). Chronic desensitization also has cognitive and affective consequences, such as increased positive attitudes toward violence and decreased empathy for violence victims (Bartholow, Sestir, & Davis, 2005; Funk et al., 2004).

Desensitization to violence is viewed as a key mediator that leads to increases in aggression and decreases in prosocial behavior as a result of violent video game play. Desensitization to violence leads to increases in aggressive cognitions and aggressive behaviors (Bartholow et al., 2005; Engelhardt et al., 2011; Krahe et al., 2011). Emotional numbing to sights of violence may also lead people to underestimate the severity of observed violence and reduce the likelihood of helping. Several studies support this prediction. For example, participants who just played a violent video game for 20 minutes are more likely to underestimate the severity of a fight they overheard and are less likely to help the injured victim (Bushman & Anderson, 2009). In the long term, violent video game play can lead to reductions in trait empathy and prosocial behavior (Gentile et al., 2009; Krahe & Möller, 2010).

### Video Games and Sexual Socialization

As the adage says, sex and violence sell. In fact, they often sell together. Video games often combine sexual imagery with violent content. Fighting games have historically been seen as a male interest; a study of Norwegian youth found that 65% of boys had played first-person shooters, compared to only 8% of girls (Endestad & Torgersen, 2003). Female gamers are sometimes subject to sexual harassment when they enter this boys' club. In the highly publicized *Cross Assault 2012* controversy, a tournament coach who repeatedly sexually harassed one of his female players while he was being recorded (Crossassaultharass, 2012) defended sexual aggression in a statement claiming, "the sexual harassment is part of the culture. And if you remove that from the fighting game community, it's not the fighting game community" (O'Leary, 2012).

Whether a symptom or cause of the player imbalance, women are greatly underrepresented as characters in video games as well. In a study of video game covers, 90% of covers depicting humans portrayed men, while 43% portrayed women, and that ratio grew to 79% men to 21% women of the total 485 human characters coded across all covers (Burgess, Stermer, & Burgess, 2007). In a study examining 33 games' character content, only 15% of games depicted a female as an action character or hero, while 30% of games had no female characters at all (Dietz, 1998). Female characters are more likely to be sexualized than male characters (Ivory, 2006). As a class, female characters are mostly given accessory, supportive, or negative roles – goals, props, bystanders, obstacles, victims, or villains (Dietz, 1998; Glaubke, Miller, Parker, & Espejo, 2001).

Exposure to sexually aggressive or violent media is associated with several negative shifts in sexual attitudes, especially in men. Men who viewed a sexually aggressive film, as compared to a physically aggressive or neutral film, demonstrated more accepting attitudes toward sexual aggression, more attraction to the idea of sexual aggression, and less sympathy toward a rape victim than did women who viewed the same material (Weisz & Earls, 1995). Frequent gamers are more likely to condone stereotypes of hyper-sexualized women and violent men (Brenick, Henning, Killen, O'Connor, & Collins, 2007). Men who watched sexualized violent video games being played demonstrated a greater increase in rape myth acceptance than did women in the same study (Beck, Boys, Rose, & Beck, 2012). Images of sex-stereotyped female video game characters were shown to increase tolerance of sexual harassment in men, while the same caused a decreased tolerance in women (Dill, Brown, & Collins, 2008).

### Video Games and Racial Stereotyping

Like women, racial minorities are also systematically underrepresented in video games. Recent content analyses demonstrate that more than two-thirds of video game characters are White (Burgess, Dill, Stermer, Burgess, & Brown, 2011; Dill, Gentile, Richter, & Dill, 2005; Williams, Martins, Consalvo, & Ivory, 2009). Non-White male characters are rare, whereas non-White female characters are almost nonexistent (Burgess et al., 2011). When racial minority characters are included, they are almost always portrayed in stereotypical (and often negative) ways. Black male characters are most often shown as street criminals or thugs (Burgess et al., 2011). Whereas violent acts performed by White protagonists are often depicted as heroic, violent acts performed by Black characters are predominantly shown as antisocial (Burgess et al., 2011; Dill et al., 2005). Arab video game characters are almost always portrayed as terrorists and are given the role of "the enemy" by American game designers (Sisler, 2008). Visual representations of such characters often contain stereotypical Arab facial features and clothing (e.g., turbans, dark skin, and facial hair; Sisler, 2008).

Social-cognitive models view media as powerful sources of social learning that can teach and reinforce beliefs about social groups (Saleem & Anderson, 2013). Thus, exposure to racial stereotypes in the media is expected to influence people's evaluations of minorities in real life. For example, stereotypical depictions of Blacks in television programs negatively influence viewers' perceptions of Blacks and reduce empathy toward this group (Dixon, 2007; Johnson, Olivo, Gibson, Reed, & Ashburn-Nardo, 2009). Recent research suggests that exposure to racial stereotypes in video games has similar effects on prejudice. For example, Saleem and Anderson (2013) demonstrated that playing a video game in which Arabs are shown as terrorists increases anti-Arab bias and perceptions of Arabs as aggressive.

### Effects on Attention and Cognitive Control

A budding, and more optimistic, area of research regarding the influence of video games is that on attention and cognitive control. As noted, video game effects can be seen as essentially the result of learning processes. Critically, such effects can produce both negative and positive outcomes, as exemplified by the influence of violent media on aggression and prosocial media on helping. In line with this idea, video games have

demonstrated both decrements and improvements on a number of visual attention-related tasks and measures.

Work by Boot et al. (2010) demonstrated that frequent video game players outperformed non-video game players on a battery of cognitive tasks including visual tracking of rapid moving objects, detecting visual changes in a complex array of items, task-switching, and mental rotation. These findings demonstrate improvements, not only in attentional tasks, but executive control and spatial information processing as well. However, in a training portion of their study, participants asked to play video games for a total of 21 hours did not outperform untrained participants on such cognitive tasks, suggesting either the presence of a selection effect, or a need for longer-term video game training. On the other hand, Green and Bavelier (2003) did find that participants trained to play a violent game demonstrated improved performance on perceptual and cognitive tests of functional field of view, attentional blink, and an enumeration task compared to those trained in *Tetris*. In other work, action video game players were better able to locate targets in visual search tasks (Wu & Spence, 2013) and demonstrate enhancements in drawing important information from visual stimuli (Applebaum, Cain, Darling, & Mitroff, 2013). Such findings are particularly interesting because it is rare that training techniques demonstrate transfer beyond the limited confines of the trained task itself (Boot, Blakely, & Simons, 2011). The focus of these studies is primarily on the effects of “action” video games, which tend to be violent first-person shooters. Ironically, these findings also hint at some potential negative effects on attention and executive functioning. It is possible, for example, that improving the ability to see into the periphery, to detect small movements, and to quickly reorient visual attention to the periphery may result in increased attention problems in the classroom, where children are expected to ignore the child fidgeting next to them.

The fast-paced nature of television and video games makes it possible for viewers to attend without the need to work hard at maintaining attention. In contrast, it takes substantially more effort to focus and sustain attention in classroom and home settings that are less exciting (Gentile, Swing, Lim, & Khoo, 2012). Indeed, several studies have found that television exposure is related to attention problems in childhood (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Landhuis, Poulton, Welch, & Hancox, 2007; Levine & Waite, 2000). Congruent findings exist for video game players (Gentile, 2009; Gentile, Swing, et al., 2012; Tolchinsky & Jefferson, 2011). Of particular interest is evidence that those with attention problems also tend to play more video games (Gentile, Swing, et al., 2012), suggesting a bi-directional relationship in which individuals with attention problems seek to play video games which potentially exacerbate their symptoms.

Other research has focused on the negative influence of video games on cognitive processes such as executive control. Bailey and colleagues (2011) demonstrated that frequent violent video game players exhibited reduced proactive control, a function involved in maintaining relevant information in memory to be used in a future task. Additionally, associations have been found between violent media use and executive control deficits measured by the Stroop task (Kronenberger et al., 2005; Mathews et al., 2005). Such findings are particularly informative considering attention disorders such as attention deficit hyperactivity disorder are considered to be partly a disorder of executive functioning (Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). Future research is necessary to examine the relations between media use, executive function deficits, and subsequent attention problems.

### School Performance

A growing body of research also suggests that entertainment video game play (as opposed to educational game play) can have detrimental effects on school performance. For example, a recent survey of a nationally representative sample of American children and adolescents showed that almost half of heavy media users get poor grades, compared to 23% of light media users (Rideout et al., 2010). Longitudinal studies demonstrate that total screen time predicts lower future school performance, even while controlling for relevant covariates (Anderson, Gentile, & Buckley, 2007; Gentile et al., 2011). Perhaps the strongest evidence of a causal relationship between video game play and school performance comes from an experimental study by Weis and Cerankosky (2010). In this study, children were randomly assigned to receive a video game system immediately or after four months. Children who immediately received the video game system had lower reading and writing scores and greater teacher-reported academic problems than children in the control group did after the four-month period.

Why does video game play lead to lower school performance? According to the displacement hypothesis, video game play displaces time that would otherwise be spent in other activities that might have more educational benefit, such as reading or creating (Gentile, Lynch, Linder, & Walsh, 2004). Several studies support this view. For example, habitual video game players spend 30% less time reading and 34% less time doing homework than non-gamers (Cummings & Vandewater, 2007). In the study by Weis and Cerankosky (2010), time spent playing video games mediated the relationship between video game system ownership and school academic performance. These findings provide evidence of displacement. However, it is possible that mechanisms other than displacement are also involved in the association between video game use and school performance. For example, several studies suggest that video game play may exacerbate attention problems and harm executive control (Bailey, West, & Anderson, 2010; Gentile, Coyne, & Bricolo, 2012; Swing, Gentile, Anderson, & Walsh, 2010), both of which are important for school success. One longitudinal study also found evidence that the relation between amount of video game and television use and school performance was mediated by sleep (Barlett, Gentile, Barlett, Eisenmann, & Walsh, 2012). That is, children who spend more time with electronic media sleep less, which has a negative impact on their school performance. Further research is needed to establish whether and how mechanisms other than displacement mediate the relationship between video game use and school performance.

It is important to note that not all video game content has such negative effects on school performance. Whereas entertainment video games have negative effects on school performance, educational video games have been successfully used as teaching aids in a number of domains (Corbett, Koedinger, & Hadley, 2001; Murphy, Penuel, Means, Korbak, & Whaley, 2001).

### Video Game Addiction

In recent years, there has been increased research interest in pathological video gaming, also termed video game addiction. Most researchers have defined video game addiction using criteria similar to those of pathological gambling – based on damage to multiple areas of functioning (e.g., academic, social, family, and occupational functioning; Sim, Gentile, Bricolo, Serpelloni, & Gulamoydeen, 2012). Video games

are initially played for entertainment and relaxation. This behavior is not problematic at first, but may become pathological for some individuals when it disrupts functioning in different areas.

Studies conducted in different countries demonstrate similar prevalence of video game addiction across culture. Among youth in the United States, 8.5% of video game players fulfill diagnostic criteria for video game addiction (Gentile, 2009), compared to 12% in Europe (Grüsser, Thalemann, & Griffiths, 2007), 10% in China (Peng & Li, 2009), and 9% in Singapore (Choo et al., 2010). These findings suggest that video game addiction is not a trivial issue. It is a condition that can affect the well-being of a substantial number of people worldwide.

Pathological video gaming shows comorbidity with other mental health disorders, including anxiety disorders, mood disorders, substance use disorders, impulse control disorders, and personality disorders (Shapira et al., 2003). A key question in this area is whether video game addiction is a distinct disorder instead of just a symptom of other conditions. A two-year longitudinal study provides evidence that impulsivity and low social competence act as risk factors for developing video game addiction, whereas gaming addiction symptoms predict later depression, anxiety, social phobia, and poorer school performance (Gentile et al., 2011). This study provides strong evidence that video game addiction is at least a comorbid mental disorder, mutually reinforcing other disorders.

Recently, the American Psychiatric Association reviewed the evidence on pathological Internet and video game use, and concluded that there was sufficient evidence to include it in the updated *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013). Before “Internet gaming disorder” will be widely accepted as a recognized mental health disorder, more research is needed concerning its prevalence, etiology, diagnosis, and treatment.

### Age Effects

Finally, there has been discussion around possible age effects moderating these effects of violent video game play. Although learning processes are generally similar for both adults and children, potential age-related differences are a valid area of concern, particularly as children may experience greater media consumption than adults. Most studies on media violence are conducted using college-aged samples. However, early research found the same effects in children that the bulk of the research found in adults – that playing violent video games increased aggression and decreased prosocial behavior (Schulte, Malouff, Post-Gorden, & Rodasta, 1988; Silvern & Williamson, 1987). Other studies, some already mentioned in this chapter, also found consistent results using child or adolescent populations (e.g., Calvert & Tan, 1994; Gentile et al., 2004).

Other forms of childhood media consumption, namely television, have been shown to predict young adult aggression even 15 years later (Huesmann, Moise-Titus, Podolski, & Eron, 2003). Finally, Bushman and Huesmann (2006), in a meta-analysis of media violence studies on children and adults, found that, while both children and adults demonstrated significant effects of television, music, movie, video game, and comic book violence on aggression, short-term effects were greater for adults while long-term effects were greater for children.

## Conclusions

The growing body of video game research, and its increasingly interdisciplinary nature, has given us greater insight into the nature of video game play. The early research found connections between violent game play and aggressive thinking, feelings, and behaviors (although at a level far lower than is often apparent from news headlines). More recent research has begun focusing on issues other than the violence itself, as researchers examine the roles the typically White male characters play vis-à-vis women and minorities. Extended violent video game play has been linked to desensitization, reduced empathy, and reduced helping behavior. Although playing video games in the violent video game genre has been linked to improvements in aspects of visual attention and executive control, extensive play is associated with poorer school performance, largely due to the amount of time taken from academic activities. For a minority of players, gaming can also take over so much of one's life that other areas are significantly damaged.

We openly acknowledge the limited category of video games this discussion covers. Although they are extremely popular, violent video games are neither the sole category nor the primary focus of the industry as a whole, and many non-violent games are being studied for possible beneficial effects. These games represent a fascinating and valuable area of application as social platforms, educational or training tools, and/or entertainment. Nonetheless, the effects of violence in video games are non-trivial, having both what might be considered "positive" and "negative" effects. As video games reach further into human life, becoming more pervasive and demanding more of our time, their cumulative effects may exert a great deal of influence.

## References

- Abelson, R. P. (1981). The psychological status of the script concept. *American Psychologist*, 36(7), 715–729.
- American Psychiatric Association (APA). (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.) (DSM-5). Arlington, VA: Author.
- Anderson, C. A. (2004). An update on the effects of violent video games. *Journal of Adolescence*, 27, 113–122.
- Anderson, C. A., Berkowitz, L., Donnerstein, E., Huesmann, R. L., Johnson, J., Linz, D., ... Wartella, E. (2003). The influence of media violence on youth. *Psychological Science in the Public Interest*, 4, 81–110.
- Anderson, C. A., & Bushman, B. J. (2001). Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: A meta-analytic review of the scientific literature. *Psychological Science*, 12, 353–359.
- Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology*, 53, 27–51.
- Anderson, C. A., Carnagey, N. L., Flanagan, M., Benjamin, A. J., Eubanks, J., & Valentine, J. C. (2004). Violent video games: Specific effects of violent content on aggressive thoughts and behavior. *Advances in Experimental Social Psychology*, 36, 199–249.
- Anderson, C. A., Gentile, D. A., & Buckley, K. E. (2007). *Violent video game effects on children and adolescents: Theory, research, and public policy*. Oxford, UK: Oxford University Press.
- Anderson, C. A., Shibuya, A., Ihori, N., Swing, E. L., Bushman, B. J., Sakamoto, A., ... Saleem, M. (2010). Violent video game effects on aggression, empathy, and prosocial behavior in Eastern and Western countries. *Psychological Bulletin*, 136, 151–173.

- Applebaum, G. L., Cain, M. S., Darling, E. F., & Mitroff, S. R. (2013). Action video game playing is associated with improved visual sensitivity, but not alterations in visual sensory memory. *Attention, Perception and Psychophysics*, *75*(4), 1161–1167.
- Bailey, K., West, R., & Anderson, C. A. (2010). A negative association between video game experience and proactive cognitive control. *Psychophysiology*, *47*, 34–42.
- Bailey, K., West, R., & Anderson, C. A. (2011). The association between chronic exposure to video game violence and affective picture processing: An ERP study. *Cognitive, Affective, and Behavioral Neuroscience*, *11*, 259–276.
- Bandura A. (1977). *Social learning theory*. New York, NY: Prentice Hall.
- Barlett, N., Gentile, D. A., Barlett, C. P., Eisenmann, J. C., & Walsh, D. A. (2012). Sleep as a mediator of screen time effects on U.S. children's health outcomes: A prospective study. *Journal of Children and Media*, *6*(1), 37–50.
- Bartholow, B. D., Bushman, B. J., & Sestir, M. A. (2006). Chronic violent video game exposure and desensitization: Behavioral and event-related brain potential data. *Journal of Experimental Social Psychology*, *42*, 532–539.
- Bartholow, B. D., Sestir, M. A., & Davis, E. (2005). Correlates and consequences of exposure to video game violence: Hostile personality, empathy, and aggressive behavior. *Personality and Social Psychology Bulletin*, *31*, 1573–1586.
- Beck, V. S., Boys, S., Rose, C., & Beck, E. (2012). Violence against women in video games: A prequel or sequel to rape myth acceptance? *Journal of Interpersonal Violence*, *27*(15), 3016–3031.
- Berkowitz, L. (1990). On the formation and regulation of anger and aggression: A cognitive neoassociationistic analysis. *American Psychologist*, *45*, 494–503.
- Berkowitz, L. (1993). Pain and aggression: Some findings and implications. *Motivation and Emotion*, *17*(3), 277–293.
- Boot, W. R., Basak, C., Erickson, K. I., Neider, M., Simons, D. J., Fabiani, M., ... Kramer, A. F. (2010). Transfer of skill engendered by complex task training under conditions of variable priority. *Acta Psychologica*, *135*, 349–357.
- Boot, W. R., Blakely, D. P., & Simons, D. J. (2011). Do action video games improve perception and cognition? *Frontiers in Psychology*, *2*, 226.
- Brenick, A., Henning, A., Killen, M., O'Connor, A., & Collins, M. (2007). Social evaluations of stereotypic images in video games: Unfair, legitimate, or "just entertainment"? *Youth Society*, *38*(4), 395–419.
- Bryant, J., Carveth, R. A., & Brown, D. (1981). Television viewing and anxiety: An experimental examination. *Journal of Communication*, *31*, 106–119.
- Buckley, K. E., & Anderson, C. A. (2006). A theoretical model of the effects and consequences of playing video games. In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 363–378). Mahwah, NJ: Lawrence Erlbaum Associates.
- Burgess, M. C. R., Dill, K. E., Stermer, S. P., Burgess, S. R., & Brown, B. P. (2011). Playing with prejudice: The prevalence and consequences of racial stereotypes in video games. *Media Psychology*, *14*(3), 289–311.
- Burgess, M. C. R., Stermer, S. P., & Burgess, S. R. (2007). Sex, lies, and video games: The portrayal of male and female characters on video game covers. *Sex Roles*, *57*, 419–433.
- Bushman, B. J., & Anderson, C. A. (2009). Comfortably numb: Desensitizing effects of violent media on helping others. *Psychological Science*, *20*, 273–277.
- Bushman, B. J., & Huesmann, L. R. (2006). Short-term and long-term effects of violent media on aggression in children and adults. *Archives of Pediatrics and Adolescent Medicine*, *160*(4), 348–352.
- Calvert, S. L., & Tan, S. (1994). Impact of virtual reality on young adults' physiological arousal and aggressive thoughts: Interaction versus observation. *Journal of Applied Developmental Psychology*, *15*(1), 125–139.
- Cantor, J. (1998). *Mommy, I'm scared! How TV and movies frighten children and what we can do to protect them*. San Diego, CA: Harvest/Harcourt.

- Carnagey, N. L., & Anderson, C. A. (2005). The effects of reward and punishment in violent video games on aggressive affect, cognition, and behavior. *Psychological Science, 16*(11), 882–889.
- Carnagey, N. L., Anderson, C. A., & Bushman, B. J. (2007). The effect of video game violence on physiological desensitization to real life violence. *Journal of Experimental Social Psychology, 43*, 489–496.
- Choo, H., Gentile, D. A., Sim, T., Li, D., Khoo, A., & Liau, A. K. (2010). Pathological video-gaming among Singaporean youth. *Annals of the Academy of Medicine Singapore, 39*, 822–829.
- Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics, 113*(4), 708–713.
- Corbett, A. T., Koedinger, K. R., & Hadley, W. (2001). Cognitive tutors: From the research classroom to all classrooms. In P. S. Goodman (Ed.), *Technology-enhanced learning* (pp. 235–263). Mahwah, NJ: Lawrence Erlbaum Associates.
- Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115*, 74–101.
- Crossassaulttharass. (2012, February 28). Day 1: Sexual harassment on Cross Assault. Retrieved August 23, 2013, from [https://www.youtube.com/watch?feature=player\\_embedded&v=0SLDgPbjp0M](https://www.youtube.com/watch?feature=player_embedded&v=0SLDgPbjp0M)
- Cummings, H. M. M., & Vandewater, E. A. P. (2007). Relation of adolescent video game play to time spent in other activities. *Archives of Pediatric and Adolescent Medicine, 161*(7), 684–689.
- Dietz, T. L. (1998). An examination of violence and gender role portrayals in video games: Implications for gender socialization and aggressive behavior. *Sex Roles, 38*(5/6), 425–442.
- Dill, K. E., Anderson, C. A., Anderson, K. B., & Deuser, W. E. (1997). Effects of aggressive personality on social expectations and social perceptions. *Journal of Research in Personality, 31*, 272–292.
- Dill, K. E., Brown, B. P., & Collins, M. A. (2008). Effects of media stereotypes on sexual harassment judgments and rape supportive attitudes: Popular video game characters, gender, violence and power. *Journal of Experimental Social Psychology, 44*, 1402–1408.
- Dill, K. E., Gentile, D. A., Richter, W. A., & Dill, J. C. (2005). Violence, sex, race and age in popular video games: A content analysis. In E. Cole & J. Henderson Daniel (Eds.), *Featuring females: Feminist analyses of the media*. Washington, DC: American Psychological Association.
- Dixon, T. L. (2007). Black criminals and White officers: The effects of racially misrepresenting law breakers and law defenders on television news. *Media Psychology, 10*, 270–291.
- Dodge, A. K. (2010). Social information processing patterns as mediators of the interaction between genetic factors and life experiences in the development of aggressive behavior. In P. Shaver & M. Mikulincer (Eds.), *Human aggression and violence: Causes, manifestations, and consequences* (pp. 165–185). Washington, DC: American Psychological Association.
- Endestad, T., & Torgersen, L. (2003, November). *Computer games and violence: Is there really a connection?* Paper presented at Digital Games Research Conference, University of Utrecht, the Netherlands.
- Engelhardt, C. R., Bartholow, B. D., Kerr, G. T., & Bushman, B. J. (2011). This is your brain on violent video games: Neural desensitization to violence predicts increased aggression following violent video game exposure. *Journal of Experimental Social Psychology, 47*, 1033–1036.
- Escobar-Chaves, S. L., & Anderson, C. A. (2008). Media and risky behaviors. *Future of Children, 18*(1), Special issue on Media Technology in the Lives of Children. Retrieved December 6, 2014, from <http://futureofchildren.org/futureofchildren/publications/journals/article/index.xml?journalid=32&articleid=60>

- Ferguson, C. J. (2007a). Video games: The latest scapegoat for violence. *Chronicle of Higher Education: Chronicle Review*, 53(42), B20.
- Ferguson, C. J. (2007b). The good, the bad and the ugly: A meta-analytic review of positive and negative effects of violent video games. *Psychiatric Quarterly*, 78, 309–316.
- Fischer, P., Kastenmüller, A., & Greitemeyer, T. (2010). Media violence and the self: The impact of personalized gaming characters in aggressive video games on aggressive behavior. *Journal of Experimental Social Psychology*, 46(1), 192–195.
- Fung, B. (2013, August 13). Humankind has now spent more time playing *Call of Duty* than it has existed on earth. *The Washington Post*. Retrieved from <http://www.washingtonpost.com/blogs/the-switch/wp/2013/08/13/humankind-has-now-spent-more-time-playing-call-of-duty-than-it-has-existed-on-earth/>
- Funk, J. B., Baldacci, H. B., Pasold, T., & Baumgardner, J. (2004). Violence exposure in real-life, video games, television, movies, and the Internet: Is there desensitization? *Journal of Adolescence*, 27(1), 23–39.
- Funk, J., Hagan, J., & Schimming, J. (1999). Children and electronic games: A comparison of parents' and children's perceptions of children's habits and preferences in a United States sample. *Psychological Reports*, 85(3), 883–888.
- Gentile, D. A. (2009). Pathological video-game use among youth ages 8 to 18. *Psychological Science*, 20, 594–602.
- Gentile, D. A., & Anderson, C. A. (2003). Violent video games: The newest media violence hazard. In D. Gentile (Ed.), *Media violence and children* (pp. 131–152). Westport, CT: Praeger.
- Gentile, D. A., Anderson, C. A., Yukawa, S., Ithori, N., Saleem, M., Ming, L. K., ... Sakamoto, A. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from correlational, experimental, and longitudinal studies. *Personality and Social Psychology Bulletin*, 35, 752–763.
- Gentile, D. A., & Bushman, B. J. (2012). Reassessing media violence effects using a risk and resilience approach to understanding aggression. *Psychology of Popular Media Culture*, 1(3), 138–151.
- Gentile, D. A., Choo, H., Liau, A., Sim, T., Li, D., Fung, D., & Khoo, A. (2011). Pathological video game use among youths: A two-year longitudinal study. *Pediatrics*, 127, 319–329.
- Gentile, D. A., Coyne, S. M., & Bricolo, F. (2012). Pathological technology addictions: What is scientifically known and what remains to be learned. In K. E. Dill (Ed.), *Oxford handbook of media psychology* (pp. 382–402). Oxford, UK: Oxford University Press.
- Gentile, D. A., Groves, C., & Gentile, J. R. (2014). The general learning model: Unveiling the teaching potential of video games. In F. C. Blumberg (Ed.), *Learning by playing: Video gaming in education* (pp. 121–142). New York, NY: Oxford University Press.
- Gentile, D. A., Lynch, P. J., Linder, J. R., & Walsh, D. A. (2004). The effects of violent video game habits on adolescent hostility, aggressive behaviors, and school performance. *Journal of Adolescence*, 27, 5–22.
- Gentile, D. A., Swing, E. L., Anderson, C. A., Rinker, D., & Thomas, K. M. (2014). Differential neural recruitment during violent video game play in violent- and nonviolent-video game players. *Psychology of Popular Media Culture*. doi: 10.1037/ppm0000009
- Gentile, D. A., Swing, E. L., Lim, C. G., & Khoo, A. (2012). Video game playing, attention problems, and impulsiveness: Evidence of bidirectional causality. *Psychology of Popular Media Culture*, 1(1), 62–70.
- Glaubke, C. R., Miller, P., Parker, M. A., & Espejo, E. (2001). *Fair play? Violence, gender and race in video games*. Oakland, CA: Children Now.
- Gollwitzer, M., & Melzer, A. (2012). Macbeth and the joystick: Evidence for moral cleansing after playing a violent video game. *Journal of Experimental Social Psychology*, 48(6), 1356–1360.
- Green, S., & Bavelier, D. (2003). Action video game modifies visual selective attention. *Nature*, 423, 534–537.
- Greitemeyer, T., & Osswald, S. (2010). Effects of prosocial video games on prosocial behavior. *Journal of Personality and Social Psychology*, 98(2), 211–221.

- Groves, C. L., Prot, S., & Anderson, C. A. (in press). Violent media effects: Theory and evidence. In H. Friedman (Ed.), *Encyclopedia of mental health* (2nd ed.). San Diego, CA: Elsevier.
- Grüsser, S. M., Thalemann, R., & Griffiths, M. D. (2007). Excessive computer game playing: Evidence for addiction and aggression? *CyberPsychology and Behavior*, *10*(2), 290–292.
- Huesmann, R. L. (1988). An information processing model for the development of aggression. *Aggressive Behavior*, *14*, 13–24.
- Huesmann, R. L., Moise-Titus, J., Podolski, C.-L., & Eron, L. D. (2003). Longitudinal relations between children's exposure to TV violence and their aggressive and violent behavior in young adulthood: 1977–1992. *Developmental Psychology*, *39*(2), 201–221.
- Ivory, J. D. (2006). Still a man's game: Gender representation in online reviews of video games. *Mass Communication and Society*, *9*(1), 103–114.
- Johnson, J. D., Olivo, N., Gibson, N., Reed, W., & Ashburn-Nardo, L. (2009). Priming media stereotypes reduces support for social welfare policies: The mediating role of empathy. *Personality and Social Psychology Bulletin*, *35*, 463–476.
- Konijn, E. A., Nije Bijvank, M., & Bushman, B. J. (2007). I wish I were a warrior: The role of wishful identification in the effects of violent video games on aggression in adolescent boys. *Developmental Psychology*, *43*(4), 1038–1044.
- Krahé, B., & Möller, I. (2010). Longitudinal effects of media violence on aggression and empathy among German adolescents. *Journal of Applied Developmental Psychology*, *31*, 401–409.
- Krahé, B., Möller, I., Huesmann, L. R., Kirwil, L., Felber, J., & Berger, A. (2011). Desensitization to media violence: Links with habitual media violence exposure, aggressive cognitions, and aggressive behavior. *Journal of Personality and Social Psychology*, *100*(4), 630–646.
- Kronenberger, W. G., Mathews, V. P., Dunn, D. W., Wang, Y., Wood, E. A., Giauque, A. L., ... Li, T. (2005). Media violence exposure and executive functioning in aggressive and control adolescents. *Journal of Clinical Psychology*, *61*(6), 725–737.
- Landhuis, C. E., Poulton, R., Welch, D., & Hancox, R. J. (2007). Does childhood television viewing lead to attention problems in adolescence? Results from a prospective longitudinal study. *Pediatrics*, *120*, 532–537.
- Levine, L. E., & Waite, B. M. (2000). Television viewing and attentional abilities in fourth and fifth grade children. *Journal of Applied Developmental Psychology*, *21*(6), 667–679.
- Mathews, V. P., Kronenberger, W. G., Wang, Y., Lurito, J. T., Lowe, M. J., & Dunn, D. W. (2005). Media violence exposure and frontal lobe activation measured by functional magnetic resonance imaging in aggressive and nonaggressive adolescents. *Journal of Computer Assisted Tomography*, *29*(3), 287–292.
- McGonigal, J. (2010). Gaming can make a better world. *Ted 2010*. Retrieved from <http://www.iftf.org/our-work/people-technology/games/jane-mcgonigal-at-ted/>
- Moller, I., & Krahé, B. (2009). Exposure to violent video games and aggression in German adolescents: A longitudinal analysis. *Aggressive Behavior*, *35*, 75–89.
- Moore, G. E. (1965, April). Cramming more components onto integrated circuits. *Electronics*, 114–117.
- Mullin, C. R., & Linz, D. (1995). Desensitization and resensitization to violence against women: Effects of exposure to sexually violent films on judgments of domestic violence victims. *Journal of Personality and Social Psychology*, *69*, 449–459.
- Murphy, R., Penuel, W., Means, B., Korbak, C., & Whaley, A. (2001). *E-desk: A review of recent evidence on the effectiveness of discrete educational software*. Menlo Park, CA: SRI International.
- NPD Group. (2010, March 2). Number of digitally downloaded games purchased by online gamers rises for third consecutive year. Retrieved from [https://www.npd.com/wps/portal/npd/us/news/press-releases/pr\\_100302/](https://www.npd.com/wps/portal/npd/us/news/press-releases/pr_100302/)
- O'Leary, A. (2012, August 1). In virtual play, sex harassment is all too real. *The New York Times*. Retrieved August 23, 2013, from <http://www.nytimes.com/2012/08/02/us/sexual-harassment-in-online-gaming-stirs-anger.html>
- Peng, L., & Li, X. (2009). A survey of Chinese college students addicted to video games. *China Education Innovation Herald*, *28*, 111–112.

- Polman, A., Orobio de Castro, B., & van Aken, M. A. G. (2008). Experimental study of the differential effects of playing versus watching violent video games on children's aggressive behavior. *Aggressive Behavior, 34*(3), 256–264.
- Rideout, V. J., Foehr, U. G., & Roberts, D. F. (2010). *Generation M<sup>2</sup>: Media in the lives of 8–18 year olds*. Menlo Park, CA: Henry J. Kaiser Foundation.
- Saleem, M., & Anderson, C. A. (2013). Arabs as terrorists: Effects of stereotypes within violent contexts on attitudes, perceptions and affect. *Psychology of Violence, 3*, 84–99.
- Schulte, N. S., Malouff, J. M., Post-Gorden, J. C., & Rodasta, A. L. (1988). Effects of playing videogames on children's aggressive and other behaviors. *Journal of Applied Social Psychology, 18*(5), 454–460.
- Shapira, N. A., Lessig, M. C., Goldsmith, T. D., Szabo, S. T., Lazoritz, M., Gold, M. S., & Stein, D. J. (2003). Problematic Internet use: Proposed classification and diagnostic criteria. *Depression and Anxiety, 17*(4), 207–216.
- Sherry, J. L. (2001). The effects of violent video games on aggression: A meta-analysis. *Human Communication Research, 27*, 409–431.
- Silvern, S. B., & Williamson, P. A. (1987). The effects of video game play on young children's aggression, fantasy, and prosocial behavior. *Journal of Applied Developmental Psychology, 8*(4), 453–462.
- Sim, T., Gentile, D. A., Bricolo, F., Serpelloni, G., & Gulamoydeen, F. (2012). A conceptual review of research on the pathological use of computers, video games, and the Internet. *International Journal of Mental Health and Addiction, 10*(5), 748–769.
- Sisler, V. (2008). Digital Arabs: Representation in video games. *European Journal of Cultural Studies, 11*, 203–220.
- Swing, E., Gentile, D. A., Anderson, C. A., & Walsh, D. A. (2010). Television and video game exposure and the development of attention problems. *Pediatrics, 126*, 214–221.
- Tedeschi, J. T., & Felson, R. B. (1994). *Violence, aggression, and coercive actions*. Washington, DC: American Psychological Association.
- Tolchinsky, A., & Jefferson, S. D. (2011). Problematic video game play in a college sample and its relationship to time management skills and attention-deficit/hyperactivity disorder symptomology. *Cyberpsychology, Behavior, and Social Networking, 14*(9), 489–496.
- Uhlmann, E., & Swanson, J. (2004). Exposure to violent video games increases automatic aggressiveness. *Video Games and Public Health, 27*(1), 41–52.
- Weis, R., & Cerankosky, B. C. (2010). Effects of video-game ownership on young boys' academic and behavioral functioning: A randomized, controlled study. *Psychological Science, 21*(4), 463–470.
- Weisz, M. G., & Earls, C. M. (1995). The effects of exposure to filmed sexual violence on attitudes toward rape. *Journal of Interpersonal Violence, 10*(1), 71–84.
- Welch, H. (2012, December 13). America's love affair with the first person shooter and the rise of "Call of Duty: Black Ops II." *ComplexGaming*. Retrieved from <http://www.complex.com/video-games/2012/11/americas-love-affair-with-the-first-person-shooter>
- Willcutt, E. G., Doyle, A. E., Nigg, J. T., Faraone, S. V., & Pennington, B. F. (2005). Validity of the executive function theory of attention deficit/hyperactivity disorder: A meta-analytic review. *Biological Psychiatry, 57*, 1336–1346.
- Williams, D., Martins, N., Consalvo, M., & Ivory, J. (2009). The virtual census: Representations of gender, race and age in video games. *New Media and Society, 11*(5), 815–834.
- Wu, S., & Spence, I. (2013). Playing shooter and driving videogames improves top-down guidance in visual search. *Attention, Perception and Psychophysics, 75*, 673–686.
- Zillmann, D. (1971). Excitation transfer in communication-mediated aggressive behavior. *Journal of Experimental Social Psychology, 7*(4), 419–434.