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Negative Effects of Video Game Play

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Abstract

Video game play has become a ubiquitous form of entertainment in modern society. As a result, interest has accrued from parents, educators, policy makers, and scientists alike regarding the potential effects of this relatively new media. The current chapter has several goals. The first is to describe the research findings regarding the most heavily studied topic in video game research: the effects of violent video game content on aggressive affect, cognition, and behavior. The second goal is to describe the psychological processes that give rise to aggressive (and nonaggressive) negative outcomes of video game play. These psychological processes are described by the General Aggression Model (GAM) and the domain-specific theories which GAM incorporates. These "smaller" theories include (but are not limited to) script theory, attribution and decision-making, cognitive neoassociation theory, learning theories, and desensitization. Several other negative outcomes of video game play are also described which include risk taking, attention problems, impulsivity, reduced helping, stereotyping, and video game addiction. Some discussion focuses on specific types of game content (e.g., game mechanics and themes) to the outcomes observed among game players. Lastly, special attention is paid to explaining that the processes that give rise to negative effects are often the same processes that give rise to positive effects and that the notion that games should be considered either "good" or "bad" is much too simplistic. It is our hope that this chapter serves to provide a clear understanding of the negative effects of video game play but also underscores that games also have tremendous potential for positive outcomes.

Keywords: Video game Aggression Attention problems Stereotyping General aggression model

The advent of computerized technology has transformed the entertainment industry. Tablets, phones, home computers, and game consoles have provided unprecedented access to movies, television shows, and video games. No shift in human entertainment is as marked as the advent of video games. Indeed, this relatively new form of entertainment has exploded in popularity since its beginnings in the 1980s. In a 2009 survey, 88 % of American youth between the ages of 8 and 18 reported playing video games at least occasionally with an average time spent per week at 13.2 h (Gentile). The amount of time spent on video games continues to increase, though comparable data are scarce. Interestingly, increases in video game time have not led to decreases in television time.

The number of hours that children and adolescents spend playing video games has led policy makers, parents, teachers, and researchers alike to question the potential negative and positive effects of this relatively new medium. Mirroring the concerns expressed in the early years of television use, violent content present within video games has sparked both research and debate. Although the current chapter's focus is on the negative effects of video game play, we emphatically note that video games are not inherently "bad." Theoretically, there are likely a variety of cognitive and social benefits of video game play, and many such positive effects have received empirical support (e.g., Prot et al. *2014a*). Well-designed video games are excellent teachers that are highly motivating, engaging, and responsive to the player's skills, but the lessons drawn from video games can lead to both positive and negative outcomes.

In fact, some of the processes that give rise to known harmful effects are precisely the same processes that produce some of the positive outcomes. There is perhaps no clearer example of this phenomenon than the contrast between the effects of prosocial (Prot et al. *2014b*) and violent games (Anderson et al. *2010*). As will be discussed in more detail throughout this chapter, comprehensive reviews of the empirical research literature show that violent video game play, in which players frequently kill or harm other characters, serves as a causal risk factor for aggressive behavior (Anderson *2004*; Anderson et al. *2004*, *2010*; Anderson and Bushman *2001*; Ferguson *2007a*, *b*; Greitemeyer and Mügge *2014*; Sherry *2001*). Importantly, these effects are seen even among the analyses conducted by both critics and proponents of violent media effects (Boxer et al. *2015*) and persist despite numerous tests of alternative explanations. Similarly, prosocial video games, in which players help other game characters in nonviolent ways, produce increases in empathy (Prot et al. *2014b*) and helping behavior following game play (Gentile et al. *2009*).

The academic focus on these effects reflects an understanding that individuals who consume media do not do so passively. Movies, television shows, and many games include rich stories with themes, lessons, and portrayals which impact consumers in a lasting manner. With this in mind, it is not surprising that research has focused heavily on major content themes within media, particularly video games over the past 20 years. This chapter focuses on the negative outcomes of violent video game play for two reasons. First, and foremost, it is the topic requested of us by the book editors. Second, it is by far the most heavily researched topic of studies on video game effects. There are growing research literatures on positive uses of a wide variety of types of video games, ranging from educational uses, training in numerous industries, and adjunct physical and psychological health therapies. But, those fascinating literatures lie outside the purview of this chapter.

Violent content is present in a large portion of mass media (Linder and Gentile *2009*; Smith et al. *1998*; Wilson et al. *1997*, *1998*; Thompson and Haninger *2001*; Thompson et al.

2006; Yokota and Thompson 2000). It has been the focus of research for decades, beginning with film and (later) televised violence, but has experienced renewed interest with the advent of video game play. The hypothesized effects of screen violence on increased aggressive behavior have been confirmed by major scientific organizations and by a number of large-scale meta-analyses (American Academy of Pediatrics 2009; American Psychological Association 2005; Anderson 2003; Anderson et al. 2010; Bushman and Huesmann 2006; Hearold 1986; International Society for Research on Aggression 2012; Paik and Comstock 1994; Wood et al. 1991). Special focus will be placed on explicating the psychological processes at work that give rise to violent content effects. Following this discussion, we will touch upon a variety of other negative effects of video game play, and some focus will be placed on the video game mechanics (characteristics of the games) that are the primary drivers of these more recently discovered effects.

Aggression in Media Effects Research

Aggression is defined as "any behavior directed toward another individual that is carried out with the proximate (immediate) intent to cause harm. In addition, the perpetrator must believe that the behavior will harm the target, and that the target is motivated to avoid the behavior" (Anderson and Bushman 2002, pp. 28). Because it is both unethical and impractical to induce violent behavior in the laboratory, most research on violent video game effects uses milder forms of aggressive behavior as the outcome variable of interest.

Aggressive behavior is measured using a variety of laboratory tools. A common measure is one of the many different versions of Taylor's Competitive Reaction Time Task (e.g., Anderson and Dill 2000; Anderson et al. 2004, 2007; Anderson 2003; Bartholowet al. 2005; Engelhardt et al. 2011; Katori 2001; Konijn et al. 2007). This task involves asking a research participant to compete against an ostensible other participant in reaction time trials. Each trial involves the participant clicking a box in the center of the screen once it turns from green to red. Their goal is to "beat" their opponent's click. Prior to each trial, the participant (and ostensibly, their partner) selects a noise volume and duration. If the participant wins the reaction time trial, they administer the noise blast to their opponent. These volume levels typically range from 60 dB (the sound of a normal conversation) to 105 dB (the sound of a lawn mower) and can last from 0.5 to 5 full seconds.

Another common tool used for the measure of aggression is with the use of the hot sauce paradigm (e.g., Barlett et al. 2009; Yang et al. 2014). This method involves asking a participant to partake in a food-tasting task in which other participants in the same study are asked to eat a variety of foods. The participant is given information indicating that an ostensible other participant does not like spicy food. They are then asked to select the amount of hot sauce this person must consume in order to earn their research credit. Aggressive behavior is coded by measuring the amount of hot sauce assigned to this other participant.

Although these serve as two common methods for measuring aggression in laboratory studies, there are many others. Also, it is important to note that the establishment of a phenomenon is not based on a mere few aggressive indices. Strong conclusions regarding the effect of a given stimuli (e.g., video games) rest upon the ability for the effect of that stimulus to generalize across a variety of measures that tap into the same conceptual construct (i.e., behavior intended to harm another person). For this reason, research regarding the effects of violent video games uses a number of additional measures and has established relationships between violent

video game play and verbal aggression (Krcmar and Farrar *2009*), delivering painful electric shocks to another person (Sakamoto et al. *2001*), children's peer ratings of aggressiveness, getting into arguments with teachers, getting into physical fights (Anderson et al. *2007*; Möller and Krahé *2009*), children's aggressive behavior observed during free play (Silvern and Williamson *1987*), rating someone as less deserving of financial support (Cicchirillo and Chory-Assad *2005*), making another person hold his or her hand in painfully cold ice water for an extended period of time (Ballard and Lineberger *1999*), and interfering with another person's ability to win a prize (e.g., Saleem et al. *2012*). Correlational and longitudinal studies have additionally used more extreme measures of aggression and found violent video game effects on carrying weapons on school property (e.g., Denniston et al. *2011*; Ybarra et al. *2014*), trait aggressiveness (e.g., Anderson et al. *2008*; Krahe et al. *2012*; Möller & Krahé *2009*; Shibuya et al. *2004*) violent juvenile delinquency (e.g., DeLisi et al. *2013*; Hoph et al. *2008*), and violent behavior (e.g., Anderson and Dill *2000*; Anderson et al. *2007*; Graber et al. *2006*).

Theories of Violent Media Effects

A major purpose of psychological research on media effects is to establish whether or not a hypothesized relationship exists between engaging with specific forms of content (e.g., violent content) and outcomes of individuals (e.g., aggressive behavior). An important additional goal, however, is to develop a better understanding of *how* these effects occur. Numerous theories have contributed to our understanding of violent content effects on aggressive behavior. Each of these theories is incorporated into a larger framework called the General Aggression Model (GAM; Anderson and Bushman *2002*). First, we will describe GAM before explaining each of these more domain-specific theories in turn.

The General Aggression Model is a framework that includes social, biological, and cognitive factors to help explain aggressive behavior, thoughts, and affect (emotions). Within GAM, a distinction is made between short- and long-term processes. First, we begin with the short-term processes as described by the single-cycle episode.

The single-cycle episode (Fig. 1) represents the psychological processes at work within any single given situation. As with all behavior (not just aggression), there are two forms of input that influence the behavior during a given social encounter: personological and situational variables. The personological factor includes all of the qualities of the individual that are carried across situations. These variables include all of the biological and enduring personality traits possessed by an individual including (but certainly not limited to) gender, the presence of testosterone, genetic predispositions toward aggressions, aggressive personality, agreeableness, and the like. Personological factors also include enduring beliefs (e.g., beliefs about the appropriateness of using aggression to resolve conflicts), perceptual and cognitive styles (e.g., the tendency to perceive intentional harm or threats in everyday social interactions), and attitudes. The situational factors include all characteristics of the social encounter that influence aggressive tendencies, either increasing them (e.g., receiving an insult) or decreasing them (e.g., being complimented). These factors include (but again, are certainly not limited to) the presence of provocation, exposure to violent content, temperature of the room, and aggression-inhibiting factors such as the presence of parental figures or police officers, as well as being in a setting in which aggression is socially penalized (e.g., church, a courtroom).

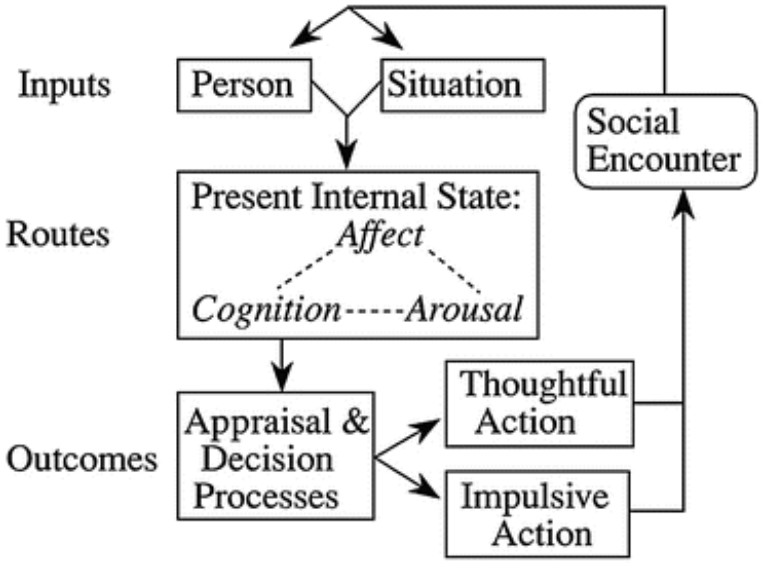

Fig. 1. Single-cycle episode within GAM (Note . Reprinted from Anderson and Bushman *2002*)

These inputs are not simply additive in that each personological and situational input simply adds to (risk factor) or subtracts from (protective factor) the propensity toward aggression. Many of these inputs interact with each other and these interactions can be quite complex. For example, when an individual is in a situation in which it is unclear whether a second party is provoking the individual (situational factor), the tendency to interpret this ambiguous situation as either a real provocation or merely an accidental harm depends on the individual's trait-like tendency to interpret ambiguous social information in hostile or friendly terms (hostile attribution bias, a personological factor discussed in more detail later in this chapter).

These two forms of input (situational and personological) then influence internal states of the individual. These internal states include affect, cognition, and arousal. Importantly, these internal states are highly interactive. That is, aggression -related cognitions influence arousal and affect, and vice versa. For example, when insulted, an individual may think that the provocation was unjustified (cognition) which influences affect (anger) and arousal (e.g., heart rate). Another important consideration is that the inputs described by GAM may affect one or more of these internal states and they do not necessarily all activate simultaneously. Again, within these two portions (and other portions as well) of the single-cycle episode, a number of interactions are possible. GAM does not directly elucidate the nature of these interactions but does provide indications of which variables may potentially interact.

In the third stage, the internal state leads to decision-making and appraisal processes. In this stage, the individual develops an immediate appraisal of how to behaviorally respond to the given situation. Like the previous stages, a variety of complex processes are at work during this stage that are elucidated more fully in other psychological literatures (e.g., spontaneous inference processes, Krull *1993*; Krull and Dill *1996*; explanation processes, Anderson et al. *1996*). When making a decision to act, individuals produce an immediate appraisal of how to react to the situation. This may lead directly to an action (an impulsive action) or may lead to a reappraisal process. In this case, the individual may reappraise their decision and decide upon an alternative action. Reappraisal processes are engaged when the individual possesses the resources including cognitive resources (such as short-term memory) and time to reappraise the decision. Two additional criteria must also be met before a reappraisal is engaged. They must find the outcome of the action to be important and unsatisfying. When a predicted outcome of

the behavior is satisfying, appraisal processes terminate and the behavior is engaged. The outcome may be unsatisfying but considered unimportant, in which case, the behavior is engaged as it would be a waste of cognitive resources to continue the reappraisal process.

The outcome of a reappraisal is not always nonaggressive. When considering the previously mentioned example in which someone is verbally insulted, the individual may initially decide to respond by returning the verbal insult. They may, however, find that the outcome of this response is important and unsatisfying after considering the unjustified nature of the original insult, the damage to one's social image, or the history of provocations received from the target individual. These examples are essentially cognitive appraisals that can additionally influence affect and arousal. This illustrates the interactive relationship that the reappraisal process has with the individual's present internal state. They may therefore decide to physically hit their provocateur which may be seen as a more justified response which can also deter future retaliation or insults.

Once the behavior has been selected and enacted, it feeds into the social situation and affects the next social encounter. The events derived from the behavior are then incorporated into the situational input factor and a new cycle begins. Each single-cycle episode can be seen as a learning trial in which the individual utilizes, develops, and reinforces knowledge structures associated with the episode. This leads to long-term changes in the individual's personality factor and influences future single-cycle episodes (see Fig. 2). These knowledge structures and related processes that lead to long-term changes in personality are discussed next.

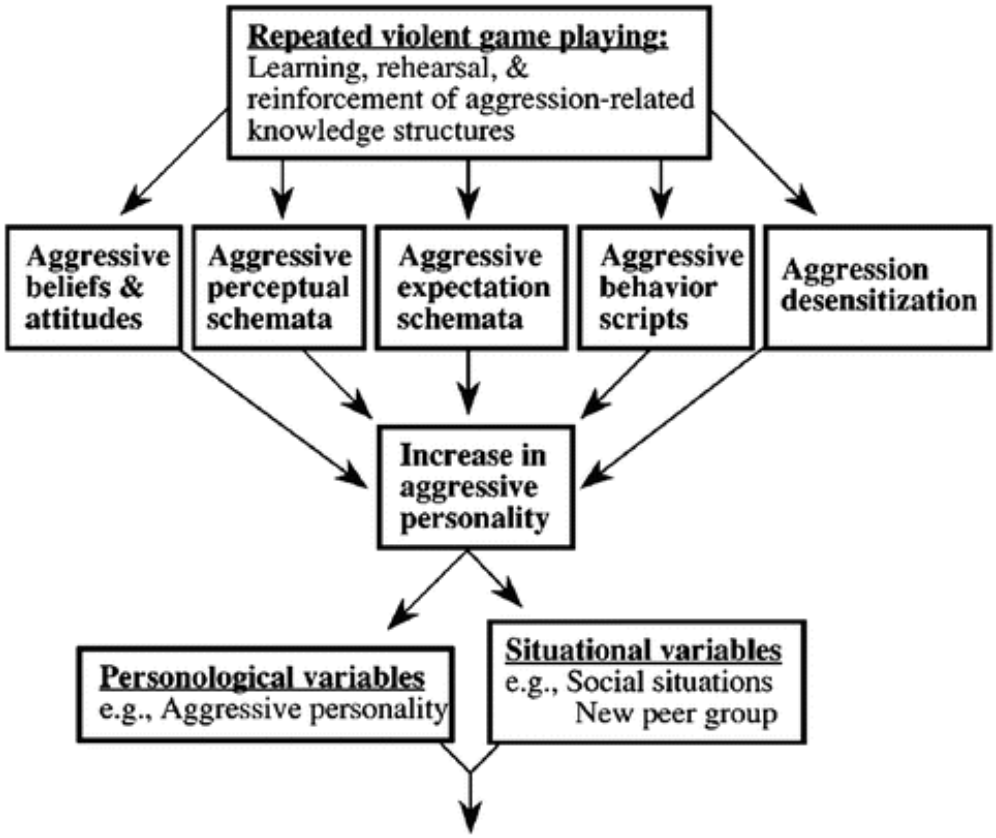

Fig. 2. Long-term processes represented in GAM (Note . Reprinted from Anderson and Bushman *2002*)

Knowledge Structures and Priming Effects

A crucial theoretical backbone of GAM is the consideration of knowledge structures in understanding aggressive behavior. Cognitive neoassociation theory (Berkowitz *1990*, *1993*) was developed in an attempt to expand upon the frustration-aggression hypothesis which posits that aggression results from frustration which is a reaction to having one's goals thwarted. Cognitive neoassociation theory states that aggression results from the experience of aversive events. These aversive events directly produce negative affect, which, in turn, activate fight-or-flight tendencies. Importantly, this theory incorporates a knowledge structure approach to assist in understanding why aggressive cues increase aggression. Aggressive cues are simply stimuli that are related to aggression. The theory rests upon the understanding that long-term memory exists as a network of related concepts and the relationships between concepts vary in strength (Collins and Loftus *1975*; Fig. 3). For example, the word "gun" is more closely related to the word "murder" than the word "orange." When a given concept is activated (primed), a spreading of activation occurs in which concepts that are closely related to the primed concept are also activated. This conceptual structure includes thoughts, affect, and behavioral tendencies which are all activated when presented with a cue. When viewing images of violence, aggression-related concepts are activated in memory, and the mind is effectively primed to operate using these knowledge structures.

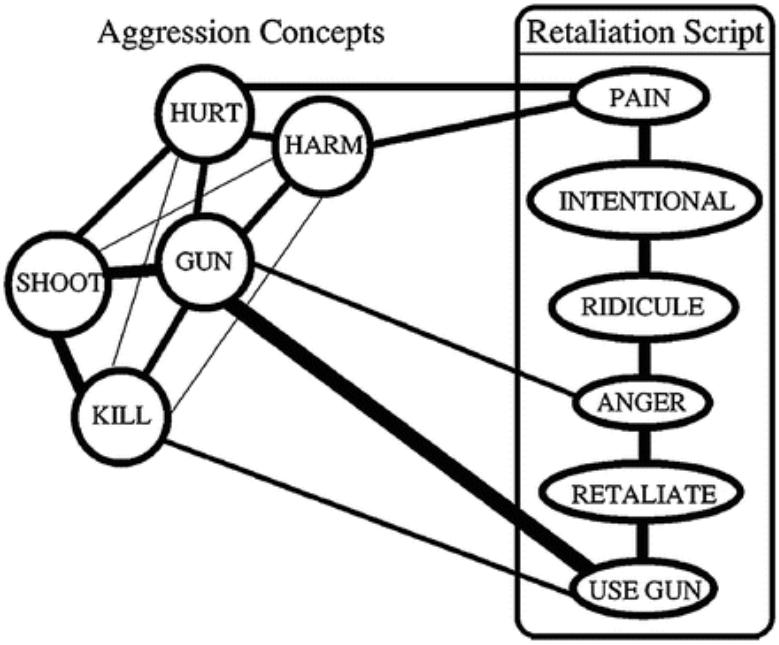

Fig. 3. Example organization of knowledge structures (Note . Reprinted from Anderson and Bushman *2002*)

This priming effect is among the most influential and heavily studied phenomena across multiple domains of psychology. To demonstrate the generalizability of this process, some nonaggressive examples will be presented first. In a famous series of studies by Bargh et al. (*1996*), participants were randomly assigned to complete one of three versions of a sentence scramble test in which participants were tasked with unscrambling a small set of words to form a sentence. In one version, half of the sentences included words that were conceptually related to the concept of "rudeness" (e.g., disturb, intrude, interrupt, impolite). In another version, these terms were replaced with words related to the concept of "politeness" (e.g., respect, considerate,

yield, courteous). A third group of participants unscrambled sentences containing neutral words, unrelated to either rudeness or politeness. After completing this task, the participant approached the experimenter to receive their next task. The experimenter, however, speaks to a confederate for an extended period of time in which she/he does not acknowledge the participant. Of primary interest was whether participants interrupted the experimenter in order to request their next task. As predicted, participants who unscrambled sentences containing words related to "rudeness" were more likely to interrupt the experimenter compared to participants primed with either neutral or polite words. In a subsequent experiment, participants primed with "elderly"-related words walked more slowly when leaving an experiment. In the words of Bargh et al. (*1996*), "Thinking has the function of preparing the body for action…" (p. 232), and this process is highly automatic and difficult to control without direct conscious awareness and effort.

As noted above, priming effects rely on existing associations in memory (e.g., the concept of elderly is closely related to the notion of slow, methodical walking). One method for examining these associations is with a tool called the Implicit Association Task. In this task, concepts are presented on a screen in which participants are asked to respond to conceptual pairings. Words or images from the conceptual categories are presented on the center of the computer screen. Participants are instructed to press a key on either the left or right side of the keyboard based on which category is presented. For example, participants may be asked to press the "i" key if either word related to "good" or words related to "candy" are presented and press the "e" key if words related to "bad" or words related to "vegetable" are presented. Participants are presented with rapid sequences of these images, and they are instructed to categorize them as quickly as possible. These categories are then swapped so the "i" key is pressed when words related to "bad" or words related to "candy" are presented and the "e" key is pressed when words related to "good" and words related to "vegetable" are displayed. When an association between concepts is strong, reaction times are faster when the two categories share the same key press. In this case, participants' reaction times are likely to be faster when the concepts of "good" and "candy" are paired when compared to the concepts of "bad" and "candy" are paired. In other words, because these concepts are more closely related to each other, faster reaction times occur when they are paired.

This method was used in research by Klimmt et al. (*2010*) in which participants were randomly assigned to play a video game as either a soldier or a race car driver. They then completed a version of the IAT in which they were asked to pair words related to the self (e.g., "I," "me") and words related to the character they played as (e.g., "brave," "speed"). They found that reaction times were faster when participants paired self-related words with the character they played as, indicating that game play enhanced the associations participants had with qualities of the character they played as and their self-concept. In other words, video game play shifted participants' self-concept to be more in line with the character they had played. Thus, those who played a video game as a soldier temporarily had a self-concept more closely linked to "brave," whereas those who had played a video game as a race car driver had their self-concept temporarily more closely linked with "speed."

In a similar study, Bluemke et al. (*2010*) randomly assigned participants to play either a violent game in which participants shot at other characters in the game or played a nonviolent game in which all aspects of the game were identical except that participants were asked to water flowers (prosocial) or tag shapes (neutral). Participants then completed an aggression-related IAT. Those

who had just played a violent game produced faster response times to self-related words and aggression-related words among the violent game players. In essence, violent game play induced a shift toward more aggressive self-concept, and this shift can be seen as causal due to the experimental design of the study.

Other research has used different methods of testing these associations. One common method involves the use of the word-completion task. The critical difference between the IAT and the word-completion task is that the IAT measures associations between concepts, while the word-completion task measures the cognitive accessibility of a given concept. This task requires that participants fill in the blanks of incomplete words as fast as they are able. Critically, some of these words can be filled complete either aggressive or nonaggressive words. For example, the word fragment "explo_e" can be completed to form the word "explode" or "explore." Research using these tasks has observed that participants asked to play violent games are more likely to complete these fragments with aggressive words, relative to those asked to play nonviolent games (Carnagey and Anderson *2005*; Barlett and Rodeheffer *2009*). These studies and others illustrate an increase in aggressive cognitions (an umbrella term which encompasses aggressive thought accessibility) which appear to be stronger drivers of violent video game effects on aggression than other routes (e.g., affect, arousal; Anderson and Dill *2000*; Barlett and Anderson *2013*; Carnagey and Anderson *2005*).

Thus far, this knowledge structure approach has been used to describe only short-term effects. There is, however, strong evidence that the long-lasting associations that individuals have between concepts have potent implications for aggressive behavior in the long term. Furthermore, one way that strong, long-lasting links between such concepts develop is with practice. Just as one way to memorize a telephone number or multiplication tables is to repeatedly rehearse them, so too do various concepts become more strongly linked in long-term memory with frequent rehearsal.

A well-established finding in research on aggression is that aggressive cues, such as guns, automatically increase the accessibility of aggressive thoughts through the processes described above (e.g., Anderson et al. *1998*). Bartholow and colleagues (2005) used this effect to test whether individuals with contrasting associations with specific types of guns would respond differently to such primes. To do this, they exposed hunters and nonhunters to images of either hunting rifles or assault rifles. They found that images of hunting rifles were more likely to increase aggressive thoughts and behaviors among nonhunters. For hunters, however, aggression increased when they viewed images of assault rifles but not hunting rifles. Presumably, this is because hunters have a very different life history with hunting guns, a history that associates such guns with family outings (e.g., learning to hunt with dad). This finding indicates that the presence of an aggression prime relies on the existing knowledge structure to guide thoughts and behavior. Because the hunters had previously held associations with hunting rifles that were not necessarily aggressive (i.e., hunting rifles are used for sport, entertainment, or fun, rather than killing), the presence of a hunting rifle image did not activate aggression-related knowledge structures to guide behavior.

This fascinating work nicely illustrates how personal histories of associative pairing (e.g., hunting rifles and fun or sport) influence the behavioral outcome of any situational prime. There is, however, evidence that the development of such associations cannot only be measured over time (e.g., Krahé and Möller *2010*) but trained as well. In a study by Penton-Voak and colleagues (*2013*), high-risk youth were provided with a weeklong training program in which

they used a computerized program that presented them with several pictures of faces that ranged from unambiguously happy through completely ambiguous to unambiguously angry. Following the presentation of each image, these youth were asked to state whether the person was angry or happy. After providing each rating, participants were provided with feedback indicating whether the person was actually angry or happy. The key manipulation in this experiment was whether participants were "corrected" by the program to indicate that the ambiguous faces were indeed happy or angry. For some participants, the ambiguous faces were identified by the program as angry, whereas for other participants, the program identified ambiguous faces as happy. For participants who received feedback indicating that the ambiguous faces were indeed happy, self-reported aggressive behavior and anger were lower immediately following the training; this training effect persisted for at least 2 weeks (at which point data collection ceased). Further, the ratings of staff members working with these youth also reflected this behavioral shift.

From the perspective of GAM and cognitive neoassociation theory, this training paradigm modified the associations between the ambiguous faces and the appraisals regarding the internal state of these individuals, in essence changing the person's knowledge structures involving perception of other people's emotional states. Each time an ambiguous face is paired with the confirmation that the individual is happy, the features of the face are associated with the appraisal that the person is happy. With repeated trials utilizing a variety of faces, the features of ambiguous faces in general become associated with this appraisal and long-term behavioral changes result. Because ambiguous faces are now more likely to engender more positive appraisals, it is less likely that these individuals will respond to similar faces with anger or provocation.

Collectively, these studies illustrate how aggression-related knowledge structures (or nonaggressive knowledge structures) can develop over time and help drive behavior. When playing a video game with violent content, aggression-related concepts are activated and help drive behavior in the short term (i.e., produce a priming effect). Further, as individuals engage in violent game play over extended periods of time (e.g., months, years), aggression-related knowledge structures are developed and elaborated upon – creating a strong network of aggression-related concepts that are more readily activated and are therefore more likely to drive behavior.

Script and Social Learning Theory

Script theory posits that individuals possess knowledge structures that are responsible for guiding behavior based on a given situational context (Huesmann *1988*, *1986*). In a classic example, many are very familiar with what one is supposed to do when dining at a restaurant. Individuals arrive at the restaurant and (often) wait to be seated; they view the menu and order drinks then food. They eat, then pay, and eventually leave. Scripts such as this one are reinforced by viewing socially acceptable and rewarded behavior, a process elucidated by social learning theory (Bandura *1977*).

When individuals play violent video games, they repeatedly view aggressive behavior in a rewarding context. Heroes who slay enemies are rewarded with social praise by other characters in the game; they receive monetary rewards, new weapons and armor, and the like. Further, the consequences of aggressive behavior are frequently not present at all in violent games. In reality, aggressive and violent actions lead to pain, death, fear, collateral damage, and

social consequences that are rarely portrayed in video games. There are no grieving family members on the streets of the Grand Theft Auto franchise following a player's rampage.

These qualities of games make the act of aggression appear more attractive and less threatening than in reality. Players are better able to imagine themselves experiencing reward for aggressive actions and simultaneously do not fully appreciate the consequences of such actions. For example, violent television use is associated with aggressive fantasizing in boys (Viemerö and Paajanen *1992*). Further, imagining oneself engaging in behavior increases the individual's intentions to actually enact the behavior (Anderson and Godfrey *1987*). In addition, individuals who imagine themselves as the character within a violent game are also more likely to behave aggressively (Konijn et al. *2007*).

Aggressive Attitudes and Beliefs

Another major factor to consider when understanding aggressive behavior is the way in which individuals interpret the world, hold beliefs about aggressive actions, and process social information (Crick and Dodge *1994*; Dodge *2010*). Two well-understood effects of violent video game play include the development of hostile attribution biases and increases in normative beliefs about aggression.

When we see others engage in a given behavior, we make attributions about why they engaged in the behavior. For many of these decisions, this process is quite simple. When we see another individual eating, it is likely because they are hungry (or perhaps bored). At other times, information is not available to make accurate attributions regarding behavior. Instead, we rely on heuristics or mental shortcuts that allow us to make quick decisions but spare us from excessive information collection or the production of numerous possible explanations. These heuristic decision-making processes consequently lead to errors and are often based on the knowledge structures that have been developed throughout a lifetime. For example, aggressive children tend to demonstrate a hostile attribution bias. This is a tendency to interpret ambiguous provocations (i.e., a behavior that could be interpreted as either benign or hostile) in hostile terms (Crick and Dodge *1994*; Dodge *2010*; Orobio de Castro et al. *2002*). These individuals tend to perceive the behaviors of others as hostile, while most others would interpret the same behavior as accidental or otherwise. Violent video game play has been associated with this tendency in multiple longitudinal studies in which violent video game players demonstrated increases in this tendency (Anderson et al. *2007*; Gentile et al. *2011*; Möller and Krahe *2009*). A common measure requires that participants be asked to read ambiguous story stems describing a social encounter depicting ambiguous behavior (e.g., being bumped in a hallway) before asking participants to explain the reason for the behavior (e.g., it was done on purpose, the hallway was crowded). In these studies, individuals who reported high violent game play were more likely to make hostile attributions regarding the ambiguous behavior. In one of these longitudinal studies (Anderson et al. *2007*), high-frequency violent game play early in the school year predicted increases in hostile attribution biases, which, later in the school year, predicted physical aggression.

Other work has focused on the beliefs that individuals have regarding aggressive behavior – specifically their normative beliefs about aggression. For example, exposure to violent media (television and movies) increases individuals' beliefs that the world is dangerous (Bryant et al. *1981*; Gerbner et al. *1982*). This is an important factor when considering how aggressive behavior is influenced by beliefs regarding the appropriateness of such actions. In fact, research findings illustrate the relationship between violent video game play and pro-

violence attitudes (Funk et al. *2004*) and that this relationship, in turn, leads to increases in aggressive behavior (Möller and Krahé *2009*).

Desensitization to Violence

Another route through which violent video game play increases aggression is by desensitizing individuals to violence. This is a reduced emotional and physiological response to viewing violence in real life. In one major study on the topic, Carnagey et al. (*2007*) randomly assigned participants to play a violent or nonviolent game for 20 min. They then asked all participants to view a 10-min-long videotape of real-life violence while measuring participants' heart rate and galvanic skin response (another measure of physiological arousal). They found that individuals who had played the violent game displayed less physiological arousal than their nonviolent game-playing counterparts.

This tendency is not only present in the short term. Bartholow et al. (*2006*) measured the neurological responses of participants while they viewed images of actual violence. They found that the amount of long-term exposure to violent media was associated with reduced neural responding in an area of the brain that has been associated with the aversive motivational system. Further, this reduced response predicted increases in aggressive behavior.

When we are faced with the decision to aggress, an important factor we consider is how aversive the act of aggression appears to us. For individuals who find the notion of acting aggressively to be unpleasant, nonaggressive alternatives are more likely to be selected (Bartholow et al. *2006*; Engelhardt 2011). Further, desensitization also reduces empathy (Anderson et al. *2010*; Funk et al. *2004*) and reduces helping or prosocial behavior (Bushman and Anderson *2009*).

Relational Aggression

In addition to the effects of violent media on typical physical and verbal forms of aggressive behavior, some relatively new work has uncovered similar effects on relational forms of aggression. Relational aggression is a behavior enacted with the intent of harming another by manipulating another's relationships. This form of aggression can be either direct, as when someone threatens to withdraw their friendship from the target, or indirect, as when spreading rumors about another person. Sometimes relational aggression is verbal, but it also can be nonverbal or even a non-behavior (e.g., intentionally not inviting a classmate to a party that includes most other classmates). Some content analyses have been conducted on this topic, finding that relational aggression is well represented in some forms of media such as reality TV shows (Coyne et al. *2010*) and popular adolescent TV shows (Coyne and Archer *2004*). Much of the early work in the violent media domain has focused on the presence of physical aggression, yet these content analyses suggest that a great deal of aggressive content has been overlooked by this older literature. Research in this domain possesses two closely related foci. The first is the effect of relationally aggressive media content on aggression-related outcomes (e.g., Coyne et al. *2011*). The second is the effect of physically violent media content on relational aggression (e.g., Möller and Krahe *2009*). Both of these cross-domain content effects have been found. For instance, Coyne et al. (*2011*) found that viewing relationally aggressive media was associated with increases in relational aggression between intimate partners (e.g., threatening to break up with one's romantic partner as a coercive tactic) and this effect occurred for both males and

females. Möller and Krahe (*2009*) found that playing violent video games was related to increases in relational aggression in a cross-sectional analysis (both measures taken at the same time); however, this cross-domain relationship did not persist over time as violent game play did not predict relational aggression 30 months later.

Another interesting finding is the discovery of short-term cross-domain effects in experimental studies. In the work by Coyne et al. (*2008*), participants were randomly assigned to watch a relationally aggressive video clip, a physically aggressive video clip, or a nonaggressive video clip. The researchers found that viewing either aggressive clip led to increases in both relationally aggressive behavior and physically aggressive behavior, suggesting that a relatively "general" aggression-related knowledge network is activated by viewing either of these forms of aggression. Interestingly, these authors speculated that long-term effects may demonstrate more specificity, which is precisely what was found by Möller and Krahe (*2009*). Work in this domain is very promising as it provides the opportunity for researchers to examine any potential specificity in aggression-related knowledge structures, as well as factors that may foster or inhibit this type of specified knowledge structure development.

Nonaggressive Outcomes of Violent Game Play

As evidenced by some of the previous discussion, viewing violence in games does not solely affect aggressive behavior. Although studies of the effect of violent content on aggressiveness have made up the bulk of research attention, other outcomes of violent game play also have received some attention. Violent actions in games are often heavily associated with other game mechanics (e.g., high action) and themes (e.g., revenge) that lead to these harmful effects. Some of these effects appear to be related to violent video game play in particular while others may be solely due to high media consumption in general.

Prosocial Behavior

As mentioned previously, violent game play has been found to reduce prosocial behaviors (Anderson et al. *2010*; Greitemeyer and Mügge *2014*). In two studies on this effect, researchers examined the influence of violent media use on ecologically valid (i.e., applies well to real-world events) measures of helping behavior (Bushman and Anderson *2009*). In the first study, participants were randomly assigned to play a violent or a nonviolent game. After playing the game, they were asked to complete a questionnaire. While filling out this questionnaire, a staged fight occurred outside of the laboratory. Individuals who had played the violent game were less likely to rate the fight as serious and were less likely to "hear" the fight in the first place, relative to those who had played a nonviolent game. In their second study, they asked a woman to stand outside of a movie theater and struggle in picking up her crutches. Of primary interest was whether the length of time it took for movie goers to help would vary as a function of the type of movie they watched. As the researchers predicted, they found that it took longer for individuals to help if they had just watched a violent movie compared to a nonviolent movie. Importantly, when she struggled to pick up her crutches before the movie, violent and nonviolent movie goers helped her in an equivalent amount of time, suggesting that the violent movie viewing itself was responsible for the helping decrements, not characteristics of the people going to the movie. These findings of violent media effects on prosocial behavior are not unique to these two studies

and have been demonstrated by several research groups (Anderson et al. *2010*; Rothmund et al. *2011*; Sheese and Graziano *2005*).

Attention and Impulsivity

Attention problems have been an important area of focus in the research on negative outcomes of video game play. Briefly, it should be noted that there are several possible definitions of attention. Some scholars focus on what is termed as visual attention. One aspect of visual attention is the amount of visual space within one's field of view in which information can be processed – which is termed one's useful field of view. It, however, may be more accurate to say that this is a form of visual processing, rather than attention. Regardless, video game play has been causally associated with improvements in this visual task (Green and Bavelier *2006*).

Another, more colloquial use of the term attention, refers to the ability to maintain attention on a singular target – especially a target that does not naturally capture attention from viewers (e.g., a school lecture). It is this form of attention that several studies have identified decrements resulting from high television viewing in childhood (e.g., Christakis et al. *2004*, *2013*; Landhuis et al. *2007*; Levine and Waite *2000*; Mistry et al. *2007*). Others have linked this propensity to habitual video game play in particular (Gentile *2009*; Bioulac et al. *2008*; Mistry et al. *2007*).

A theoretical explanation for these effects is dubbed the Excitement Hypothesis (Gentile et al. *2012*). Video games (and screen media generally) are naturally exciting and stimulating. They possess a number of cues that naturally draw players' attention such as violence or sexualized imagery (Ivory *2006*; Linder and Gentile *2009*), as well as more basic attention-grabbing features such as sound effects, video editing, or flickering lighting (Kubey and Csikszentmihalyi *2002*). This continuous attentional "grabbing" may increase individuals' threshold for stimulation required to draw attention, and, therefore, they may find more menial tasks such as listening to a teacher, parent, or employer more difficult. Alternatively, it may simply be the case that children who have attention problems are more attracted to video game play and other electronic media. In the work by Gentile et al. (*2012*), support was found for both of these accounts. In other words, it appears that video game play exacerbates attention problems (also seen by Swing et al. *2010*), and individuals with attention problems are also attracted to video games.

Related to this issue, the effect of video game play on impulsivity has also demonstrated a bidirectional relationship (Gentile et al. *2012*). Individuals who played violent games in particular were more likely to agree to statements such as "I do things without thinking" and "I act on the spur of the moment" (Swing and Anderson *2014*). Further, this finding supported a unique route through which violent media use increased aggressive behavior (Swing and Anderson *2014*).

Unfortunately, it may be difficult for game designers to create games that avoid developing problems such as these. Part of the attraction that individuals undoubtedly experience for video games is that they are exciting and grab their attention. It may be prudent for designers to develop games that require slow-paced thinking which may influence attention and impulsivity in a positive manner. Though, more research is needed in this area to ensure that this is the case.

Risk Taking

Related to the observed effects of violent game play on impulsivity, risk-taking behaviors are also seen to result from certain types of video game play. Much of the research on this topic has focused on the relationship between playing racing video games and risky driving behaviors. Theoretically, the processes that give rise to increases in risky driving behaviors from racing games are similar to the processes that are responsible for violent content effects on aggression. In one report by Fischer et al. (*2009*), four separate experiments were conducted with a focus on elucidating the processes underlying the racing game – risky driving effect. As expected by the researchers, and predicted by GAM, participants assigned to play a racing game exhibited increased inclinations for reckless driving, and this effect was partially fueled by changes in participants' perceptions of themselves as risky drivers. In other words, participants who were randomly assigned to play a racing video game were consequently more likely to view themselves as risky drivers and therefore displayed more risk-taking tendencies.

This tendency is not limited solely to brief exposures to racing games. In another study by Beullens et al. (*2011*), adolescents were studied over a period of 2 years. The researchers found that respondents who played racing video games were more likely to report increased risk-taking behavior including speeding and "fun riding" (taking risks while driving to make driving more entertaining). These effects also appeared to be mediated by changes in players' attitudes and intentions regarding these behaviors. In other words, racing game players tended to have more positive attitudes toward these risk-taking behaviors, and these attitudes predicted intentions to engage in the behavior, which, in turn, predicted actual speeding behaviors. Lastly, to rule out the possibility that these relationships could be explained by an attraction hypothesis (i.e., individuals susceptible to risky driving tend to play more racing games), the authors observed these effects even after statistically controlling for aggression and sensation seeking. This provides some evidence that racing video game play influences these attitudes and behaviors, not necessarily the other way around.

While these studies focused largely on the impact of risky driving games on driving behavior, other work elucidates the impact of more general risk-glorifying games on other risk-taking behaviors. In a 4-year longitudinal study by Hull et al. (*2014*), participants were asked to report the frequency with which they played mature-rated games and their engagement in a number of risk-taking behaviors including (but not limited to) smoking, sex without a condom, and binge drinking. The authors found that mature-rated video game play was associated with increases in all of the measured risk-taking behaviors. The authors also measured a number of mediating variables and found that the increases in risk-taking behaviors were at least partially fueled by the impact of mature-rated game play on increased sensation seeking, more positive attitudes toward deviant behavior, and affiliation with more delinquent peers.

One particularly interesting result of this study was that the impact of game play on risk-taking behaviors appeared to vary as a function of the specific games that participants played. Participants were asked to report whether they had played three specific games (Spider-Man 2, Manhunt, and Grand Theft Auto III). The authors were interested in understanding whether characteristics of the protagonist would have a measurable impact on risk-taking behaviors. They found that the game with a protagonist who largely engages in risk-taking behaviors with the intent of helping others (Spider-Man 2) was only weakly related to the players' real-world

risk-taking behaviors, compared to games with protagonists who possess more deviant motives (Manhunt, Grand Theft Auto III). This makes some sense when considering the self-conceptual shifts that occur during game play discussed previously. Characters such as Spider-Man are likely not viewed as inherently "risky" individuals. They engage in risky behavior solely for the purpose of helping others. Deviant characters, on the other hand, are more likely viewed as inherently risky individuals as their risk-taking behaviors (e.g., theft, murder) are more often conducted in service of their own self-interests (e.g., fun, to obtain money, or infamy). As players engage in the roles of these characters over time, the self-concept is repeatedly paired with concepts related to the characters which then drive behavior. While not a primary purpose of the study, this finding is certainly interesting, and more work is needed to fully elucidate the processes hypothesized to be involved, especially for the long-term effects observed in this study.

Stereotyped Depictions

While depictions of stereotypes have a history in the television and movie domain, relatively less work has been done on this topic with regard to video games. Much of this work has focused on stereotypical portrayals of both men and women in video games. Female characters in video games are frequently depicted as sexualized, attractive, and weak, while males are more often portrayed as aggressive, muscular, and dominant (Beasley and Collins-Standley *2002*; Dill and Thill *2007*; Stermer and Burkley *2012*). In the work by Dill and colleagues (*2008*), participants either viewed gender-stereotyped images of video game characters or viewed images of professional men and women. They then read a real-life vignette describing a sexual harassment incident in which a male college professor harassed a female student. They found that male participants found the sexual harassment to be more tolerable when they had viewed the sexualized images of video game characters. In the other work by Beck et al. (*2012*), participants were randomly assigned to watch a series of events within a video game in which violence and sexual exploitation against women are portrayed in the game Grand Theft Auto IV or watched a video of a baseball video game being played. They found that individuals viewing the sexually stereotyped game play were more likely to endorse rape myth attitudes among male participants.

Other work has focused on depictions of characters as racially stereotyped. Researchers Saleem and Anderson (*2013*) conducted research indicating that individuals playing a video game that depicted Arab characters as terrorists observed increased anti-Arab attitudes and perceptions of Arabs as aggressive compared to participants who played other games without such depictions, although they also observed increased anti-Arab attitudes among participants who played a game with Russian terrorists. This finding suggests that there exists a strong preexisting association between Arabs and terrorism, perhaps partially resulting from televised coverage of Arabs in a stereotyped or unbalanced manner.

Unlike some of the other negative effects of video game play, it is much easier for video game developers to produce games that do not exacerbate stereotyped beliefs of players. Violent content and high pace of action are often highly related in the entertainment value of video games, at least among the general population – making the avoidance of these mechanics difficult for many developers who wish to sell as many games as possible. Stereotyped depictions of women and racial groups are, at least in contrast, much easier to avoid including in

games. The benefits of such game design decisions are not likely to reflect in a developer's checkbook, but will provide a measurable positive effect on individuals, and society at large.

Conclusion

We would like to end this chapter in a manner similar to the way in which it began: by pointing out that video games are not inherently bad and restating the veracity with which these conclusions are reported. While not the focus of the current chapter, there are a number of psychological and social benefits to video game play. The negative outcomes we have described in this chapter rely on the same basic psychological processes that are known to produce positive outcomes (e.g., the prosocial benefits of prosocial game play versus the aggressive problems resulting from violent play; Greitemeyer and Mugge *2014*). Other benefits of certain types of games, such as improvements in the useful field of view, may partially be responsible for the decrements in other areas, such as proactive executive control. As an example, for children who are better able to process visual information in their periphery, they may be more easily distracted by attention-grabbing cues in the classroom (e.g., the child fidgeting nearby; Gentile et al. *2014*). These examples illustrate the flexibility of psychological processes to give rise to a variety of outcomes and exemplify the complexity inherent in media effects research. Thus, the common question we hear from parents and policy makers – "Are video games good or bad for children and adolescent?" – is much too simplistic.

A subset of the research we have described here – particularly the effects of violent content on aggressive behavior – has been the subject of intense debate in the scientific literature (Anderson et al. *2013*; Bushman and Huesmann *2014*; Elson and Ferguson *2013a*, *b*; Ferguson *2014*; Groves et al. *2014*; Krahe *2014*; Warburton *2013*). Critics of violent media effects research are a small but vocal group who do not agree with the vast majority of media effects scholars and pediatricians (Anderson et al. *2015*; Bushman et al. *2015*). Debate within the sciences is most often seen as a healthy component of the scientific process. However, when all alternative explanations have been empirically tested and disagreement persists despite consistent empirical support, such persistent denial of well-established findings stymies scientific progress, as well as misinforms and confuses parents, teachers, game players, and developers. It is our hope that the evidence described here helps to provide a clear picture of the negative effects of video game play and assists in informing consumers and developers alike.

There are many positive aspects of video games, as attested by other chapters in this volume and by some of our own research and published papers. Indeed, both the authors of this chapter are big fans of video games in general and are excited about the future of games and their potential for positive effects in a wide array of contexts.

Recommended Reading

American Academy of Pediatrics, Policy statement – media violence. Pediatrics **124**(5), 1495–1503 (2009)

American Psychological Association, APA calls for reduction of violence in interactive media used by children and adolescents (2005), Retrieved 20 June 2013 from http://www.apa.org/news/press/releases/2005/08/video-violence.aspx

C.A. Anderson, An update on the effects of playing violent video games. J. Adolesc. **27**, 113–122 (2004)

C.A. Anderson, B.J. Bushman, Effects of violent video games on aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, and prosocial behavior: a meta-analytic review of the scientific literature. Psychol. Sci. **12**(5), 353–359 (2001)

C.A. Anderson, B.J. Bushman, Human aggression. Annu. Rev. Psychol. **53**, 27–51 (2002)

C.A. Anderson, K.E. Dill, Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. J. Pers. Soc. Psychol. **78**, 772–790 (2000)

C.A. Anderson, S.S. Godfrey, Thoughts about actions: the effects of specificity and availability of imagined behavioral scripts on expectations about oneself and others. Soc. Cogn. **5**(3), 238–258 (1987)

C.A. Anderson, Violent video games: Myths, facts, and unanswered questions. Psychological Science Agenda: Science Briefs, October, **16**(5), 1–3 (2003)

C.A. Anderson, D.S. Krull, B. Weiner, Explanations: processes and consequences, in *Social Psychology: Handbook of Basic Principles*, ed. by E.T. Higgins, A.W. Kruglanski (Guilford Press, New York, 1996), pp. 271–296

C.A. Anderson, A.J. Benjamin, B.D. Bartholow, Does the gun pull the trigger? Automatic priming effects of weapon pictures and weapon names. Psychol. Sci. **9**, 308–314 (1998)

C.A. Anderson, N.L. Carnagey, M. Flanagan, A.J. Benjamin, J. Eubanks, J.C. Valentine, Violent video games: specific effects of violent content on aggressive thoughts and behavior. Adv. Exp. Soc. Psychol. **36**, 199–249 (2004)

C.A. Anderson, D.A. Gentile, K.E. Buckley, *Violent Video Game Effects on Children and Adolescents: Theory, Research, and Public Policy* (Oxford University Press, New York, 2007)

C.A. Anderson, A. Sakamoto, D.A. Gentile, N. Ihori, A. Shibuya, S. Yukawa, M. Naito, K. Kobayashi, Longitudinal effects of violent video games on aggression in Japan and the United States. Pediatrics **122**(5), e1067–e1072 (2008). doi:10.1542/peds.2008-1425

C.A. Anderson, A. Shibuya, N. Ihori, E.L. Swing, B.J. Bushman, A. Sakamoto, H.R. Rothstein, M. Saleem, Violent video game effects on aggression, empathy, and prosocial behavior in eastern and western countries: a meta-analytic review. Psychol. Bull. **136**, 151–173 (2010)

C.A. Anderson, M. DeLisi, C.L. Groves, Subtracting from scientific knowledge about media effects. [Review of: adolescents, crime, and the media: a critical analysis by Christopher J. Ferguson]. PsycCRITIQUES **58**(51), Article 2 (2013). doi:10.1037/a0034788

C.A Anderson, L. Andrighetto, B.D. Bartholow, L. Begue, P. Boxer, J.F. Brockmyer, ... W Warburton, Consensus on media violence effects: comment on Bushman, Gollwitzer, and Cruz. Psychol. Pop. Media Cult. **4**(3), 215–221 (2015)

P. Arriaga, F. Esteves, P. Carneiro, M.B. Monterio, Are the effects of unreal violent video games pronounced when playing with a virtual reality system? Aggress. Behav. **34**, 521–538 (2008)

M.E. Ballard, R. Lineberger, Video game violence and confederate gender: effects on reward and punishment given by college males. Sex Roles **41**, 541–558 (1999)

A. Bandura, *Social Learning Theory* (General Learning Press, New York, 1977)

J.A. Bargh, M. Chen, L. Burrows, Automaticity of social behavior: direct effects of trait construct and stereotype activation on action. J. Pers. Soc. Psychol. **71**(2), 230 (1996)

C.P. Barlett, C.A. Anderson, Examining media effects: the general aggression and general learning models, in *Media Effects/Media Psychology*, ed. by E. Scharrer (Blackwell-Wiley, San Francisco, 2013), pp. 1–20e

C.P. Barlett, C. Rodeheffer, Effects of realism on extended violent and nonviolent video game play on aggressive thoughts, feelings, and physiological arousal. Aggress. Behav. **35**(3), 213–224 (2009)

C.P. Barlett, O. Branch, C. Rodeheffer, R.J. Harris, How long do the short term video game effects last? Aggress. Behav. **35**, 225–236 (2009)

B.D. Bartholow, C.A. Anderson, N.L. Carnagey, A.J. Benjamin, Individual differences in knowledge structures and priming: the weapons priming effect in hunters and nonhunters. J. Exp. Soc. Psychol. **41**, 48–60 (2005a)

B.D. Bartholow, M.A. Sestir, M.D. Davis, Correlates and consequences of exposure to videogame violence: hostile personality, empathy, and aggressive behavior. Personal. Soc. Psychol. Bull. **31**, 1573–1586 (2005b)

B.D. Bartholow, B.J. Bushman, M.A. Sestir, Chronic violent video game exposure and desensitization: behavioral and event-related brain potential data. J. Exp. Soc. Psychol. **42**, 532–539 (2006)

B. Beasley, T.C. Collins-Standley, Shirts vs. skins: clothing as an indicator of gender stereotyping in video games. Mass Commun. Soc. **5**, 279–293 (2002)

V.S. Beck, S. Boys, C. Rose, E. Beck, Violence against women in video games: a prequel or sequel to rape myth acceptance?. J. Interpers. Violence. **27**(15), 3016–3031 (2012), 0886260512441078

L. Berkowitz, On the formation and regulation of anger and aggression: a cognitive neoassociationistic analysis. Am. Psychol. **45**, 494–503 (1990)

L. Berkowitz, Pain and aggression: some findings and implications. Motiv. Emot. **17**(3), 277–293 (1993)

K. Beullens, K. Roe, J. Van den Bulck, Excellent gamer, excellent driver? The impact of adolescents' video game playing on driving behavior: a two-wave panel study. Accid. Anal. Prev. **43**(1), 58–65 (2011)

S. Bioulac, L. Arfi, M.P. Bouvard, Attention deficit/hyperactivity disorder and video games: a comparative study of hyperactive and control children. Eur. Psychiatry **23**(2), 134–141 (2008)

M. Bluemke, M. Friedrich, J. Zumbach, The influence of violent and nonviolent computer games on implicit measures of aggressiveness. Aggress. Behav. **36**(1), 1–13 (2010)

P. Boxer, C.L. Groves, M. Docherty, Video games do indeed influence children and adolescents' aggression, prosocial behavior, and academic performance: a clearer reading of Ferguson. Perspect. Psychol. Sci. **10**(5), 671–673 (2015)

J. Bryant, R.A. Carveth, D. Brown, Television viewing and anxiety: an experimental examination. J. Commun. **31**(1), 106–119 (1981)

B.J. Bushman, C.A. Anderson, Comfortably numb desensitizing effects of violent media on helping others. Psychol. Sci. **20**(3), 273–277 (2009)

B.J. Bushman, L.R. Huesmann, Short-term and long-term effects of violent media on aggression in children and adults. Archives of Pediatrics & Adolescent Medicine, **160**(4), 348–352 (2006)

B.J. Bushman, L.R. Huesmann, Twenty-five years of research on violence in digital games and aggression revisited: a reply to Elson and Ferguson (2013). Eur. Psychol. **19**, 47–55 (2014)

B.J. Bushman, M. Gollwitzer, C. Cruz, There is broad consensus: media researchers agree that violent media increase aggression in children, and pediatricians and parents concur. Psychol. Pop. Media Cult. **4**(3), 200–214 (2015)

N.L. Carnagey, C.A. Anderson, The effects of reward and punishment in violent video games on aggressive affect, cognition, and behavior. Psychol. Sci. **16**(11), 882–889 (2005)

N.L. Carnagey, C.A. Anderson, B.J. Bushman, The effect of video game violence on physiological desensitization to real life violence. J. Exp. Soc. Psychol. **43**, 489–496 (2007)

D.A. Christakis, F.J. Zimmerman, D.L. DiGiuseppe, C.A. McCarty, Early television exposure and subsequent attentional problems in children. Pediatrics **113**(4), 708–713 (2004)

D.A. Christakis, M.M. Garrison, T. Herrenkohl, K. Haggerty, F.P. Rivara, C. Zhou, K. Liekweg, Modifying media content for preschool children: a randomized controlled trial. Pediatrics **131**, 431–438 (2013)

V. Cicchirillo, R.M. Chory-Assad, Effects of affective orientation and video game play on aggressive thoughts and behaviors. J. Broadcast. Electron. Media **49**, 435–449 (2005)

A.M. Collins, E.F. Loftus, A spreading activation theory of semantic processing. Psychol. Rev. **82**, 407–428 (1975)

S.M. Coyne, D.A. Nelson, F. Lawton, S. Haslam, L. Rooney, L. Titterington, L. Ogunlaja, The effects of viewing physical and relational aggression in the media: Evidence for a cross-over effect. J. Exp. Soc. Psychol. **44**(6), 1551–1554 (2008)

S.M. Coyne, J. Archer, Indirect aggression in the media: a content analysis of British television programs. Aggress. Behav. **30**(3), 254–271 (2004)

S.M. Coyne, S.L. Robinson, D.A. Nelson, Does reality backbite? Physical, verbal, and relational aggression in reality television programs. J. Broadcast. Electron. Media **54**(2), 282–298 (2010)

S.M. Coyne, D.A. Nelson, N. Graham-Kevan, E. Tew, K.N. Meng, J.A. Olsen, Media depictions of physical and relational aggression: connections with aggression in young adults′ romantic relationships. Aggress. Behav. **37**(1), 56–62 (2011)

N.R. Crick, K.A. Dodge, A review and reformulation of social information-processing mechanisms in children′s social adjustment. Psychol. Bull. **115**, 74–101 (1994)

M. DeLisi, M.G. Vaughn, D.A. Gentile, C.A. Anderson, J. Shook, Violent video games, delinquency, and youth violence: new evidence. Youth Violence Juvenile Justice **11**, 132–142 (2013). doi:10.1177/1541204012460874

M.M. Denniston, M.H. Swahn, M.F. Hertz, L.M. Romero, Associations between electronic media use and involvement in violence, alcohol and drug use among United States high school students. West. J. Emerg. Med. **12**(3), 310 (2011)

K.E. Dill, K.P. Thill, Video game characters and the socialization of gender roles: young people′s perceptions mirror sexist media depictions. Sex Roles **57**, 851–865 (2007)

K.E. Dill, B.P. Brown, M.A. Collins, Effects of exposure to sex-stereotyped video game characters on tolerance of sexual harassment. J. Exp. Soc. Psychol. **44**(5), 1402–1408 (2008)

K.A. Dodge, Social information processing patterns as mediators of the interaction between genetic factors and life experiences in the development of aggressive behavior, in *Understanding and Reducing Aggression, Violence, and Their Consequences* (American Psychological Association, Washington, DC, 2010)

M. Elson, C.J. Ferguson, Twenty-five years of research on violence in digital games and aggression. Eur. Psychol. **19**(1), 33–46 (2013a)

M. Elson, C.J. Ferguson, Does doing media violence research make one aggressive? The ideological rigidity of social-cognitive theories of media violence and a response to Bushman and Huesmann (2013), Krahé (2013), and Warburton (2013). Eur. Psychol. **19**, 68–75 (2013b)

C.R. Engelhardt, B.D. Bartholow, G.T. Kerr, B.J. Bushman, This is your brain on violent video games: neural desensitization to violence predicts increased aggression following violent video game exposure. J. Exp. Soc. Psychol. **47**, 1033–1036 (2011a)

C.R. Engelhardt, B.D. Bartholow, J.S. Saults, Violent and nonviolent video games differentially affect physical aggression for individuals high vs. low in dispositional anger. Aggress. Behav. **37**(6), 539–546 (2011b)

C.J. Ferguson, The good, the bad and the ugly: a meta-analytic review of the positive and negative effects of violent video games. Psychiatry Q. **78**, 309–316 (2007a)

C.J. Ferguson, Evidence for publication bias in video game violence effects literature: a meta-analytic review. Aggress. Violent Behav. **12**, 470–482 (2007b)

C.J. Ferguson, When is a book review really something else? A response to the review of adolescents, crime and the media: a critical analysis . PsycCRITIQUES. **59**(10), (2014)

C.J. Ferguson, J. Kilburn, Much ado about nothing: the misestimation and over interpretation of violent video game effects in Eastern and Western nations ~ comment on Anderson et al. (2010). Psychol. Bull. **136**(2), 174–178 (2010)

P. Fischer, T. Greitemeyer, T. Morton, A. Kastenmüller, T. Postmes, D. Frey, ... J. Odenwälder, The racing-game effect: why do video racing games increase risk-taking inclinations?. Pers. Soc. Psychol. Bull. **35**, 1395–1409 (2009)

J.B. Funk, H.B. Baldacci, T. Pasold, J. Baumgardner, Violence exposure in real-life, video games, television, movies, and the internet: is there desensitization? J. Adolesc. **27**, 23–39 (2004)

D.A. Gentile, Pathological video game use among youth 8 to 18: A national study. Psychol. Sci. **20**, 594–602 (2009)

D.A. Gentile, C.A. Anderson, S. Yukawa, M. Saleem, K.M. Lim, A. Shibuya et al., The effects of prosocial video games on prosocial behaviors: international evidence from correlational, longitudinal, and experimental studies. Personal. Soc. Psychol. Bull. **35**, 752–763 (2009)

D.A. Gentile, C.L. Groves, J.R. Gentile, The General Learning Model: Unveiling the Learning Potential in Video Games. In F. Blumberg (Ed.), *Learning by Playing: Video Gaming in Education*. New York, NY: Oxford University Press, 121–142 (2014)

D.A. Gentile, S.M. Coyne, D.A. Walsh, Media violence, physical aggression and relational aggression in school age children: a short-term longitudinal study. Aggress. Behav. **37**, 193–206 (2011)

D.A. Gentile, E.L. Swing, C.G. Lim, A. Khoo, Video game playing, attention problems, and impulsiveness: evidence of bidirectional causality. Psychol. Pop. Media Cult. **1**(1), 62–70 (2012)

G. Gerbner, L. Gross, M. Morgan, N. Signorielli, Charting the mainstreaming: television′s contributions to political orientations. J. Commun. **32**, 100–127 (1982)

J.A. Graber, T. Nichols, S.D. Lynne, J. Brooks-Gunn, G.J. Botvin, A longitudinal examination of family, friend, and media influences on competent versus problem behaviors among urban minority youth. Appl. Dev. Sci. **10**, 75–85 (2006)

C.S. Green, D. Bavelier, Effect of action video games on the spatial distribution of visuospatial attention. J. Exp. Psychol. Hum. Percept. Perform. **32**(6), 1465 (2006)

T. Greitemeyer, D.O. Mügge, Video games do affect social outcomes: a meta-analytic review of the effects of violent and prosocial video game play. Personal. Soc. Psychol. Bull. **40**(5), 578–589 (2014)

C.L. Groves, C.A. Anderson, M. DeLisi, A response to Ferguson: more red herring. *PsycCRITIQUES.* **59**(10) article 9 (2014). doi:10.1037/a0036266

S. Hearold, A synthesis of 1043 effects of television on social behavior, in *Public Communication and Behavior*, ed. by G. Comstock, vol. 1 (Academic, New York, 1986), pp. 66–133

W.H. Hoph, G.L. Huber, R.H. Weib, Media violence and youth violence: a 2-year longitudinal study. J. Media Psychol. **20**, 79–96 (2008)

L.R. Huesmann, Psychological processes promoting the relation between exposure to media violence and aggressive behavior by the viewer. J. Soc. Issues **42**(3), 125–139 (1986)

R.L. Huesmann, An information processing model for the development of aggression. Aggress. Behav. **14**, 13–24 (1988)

J.G. Hull, T.J. Brunelle, A.T. Prescott, J.D. Sargent, A longitudinal study of risk-glorifying video games and behavioral deviance. J. Pers. Soc. Psychol. **107**(2), 300 (2014)

International Society for Research on Aggression, Report of the media violence commission. Aggress. Behav. **38**, 335–341 (2012)

J.D. Ivory, Still a man′s game: gender representation in online reviews of video games. Mass Commun. Soc. **9**(1), 103–114 (2006)

T. Katori, Bouryokuteki bideogemu no kougeki sokushin kouka to sougosayousei [The effects of violent video games and interactivity on aggression]. in *Proceedings of the 42nd convention of the Japanese Society of Social Science,* pp. 602–603 (2001)

C. Klimmt, D. Hefner, P. Vorderer, C. Roth, C. Blake, Identification with video game characters as automatic shift of self-perceptions. Media Psychol. **13**(4), 323–338 (2010)

E.A. Konijn, M.N. Bijnank, B.J. Bushman, I wish I were a warrior: the role of wishful identification in the effects of violent video games on aggression in adolescent boys. Dev. Psychol. **43**, 1038–1044 (2007)

B. Krahé, I. Möller, Longitudinal effects of media violence on aggression and empathy among German adolescents. J. Appl. Dev. Psychol. **31**(5), 401–409 (2010)

B. Krahé, Restoring the spirit of fair play in the debate about violent video games: a comment on Elson and Ferguson (2013). Eur. Psychol. **19**, 56–59 (2014)

B. Krahe, R. Bushing, I. Moller, Media violence use and aggression among German adolescents: associations and trajectories of change in a three-wave longitudinal study. Psychol. Pop. Media Cult. **1**, 152–156 (2012)

M. Krcmar, K. Farrar, Retaliatory aggression and the effects of point of view and blood in violent video games. Mass Commun. Soc. **12**(1), 115–138 (2009)

D.S. Krull, Does the grist change the mill? The effect of the perceiver's inferential goal on the process of social inference. Personal. Soc. Psychol. Bull. **19**(3), 340–348 (1993)

D.S. Krull, J.C. Dill, On thinking first and responding fast: flexibility in social inference processes. Personal. Soc. Psychol. Bull. **22**(9), 949–959 (1996)

R. Kubey, M. Csikszentmihalyi, Television addiction. Sci. Am. **286**(2), 74–81 (2002)

C.E. Landhuis, R. Poulton, D. Welch, R.J. Hancox, Does childhood television viewing lead to attention problems in adolescence? Results from a prospective longitudinal study. Pediatrics, **120**(3), 532–537 (2007)

L.E. Levine, B.M. Waite, Television viewing and attentional abilities in fourth and fifth grade children. J. Appl. Dev. Psychol. **21**(6), 667–679 (2000)

J.R. Linder, D.A. Gentile, Is the television rating system valid? Indirect, verbal, and physical aggression in programs viewed by fifth grade girls and associations with behavior. J. Appl. Dev. Psychol. **30**(3), 286–297 (2009)

K.B. Mistry, C.S. Minkovitz, D.M. Strobino, D.L. Borzekowski, Children's television exposure and behavioral and social outcomes at 5.5 years: does timing of exposure matter? Pediatrics **120**, 762–769 (2007)

I. Möller, B. Krahe, Exposure to violent video games and aggression in German adolescents: a longitudinal analysis. Aggress. Behav. **35**, 75–89 (2009)

B. Orobio de Castro, J.W. Veerman, W. Koops, J.D. Bosch, H.J. Monshouwer, Hostile attribution of intent and aggressive behavior: a meta-analysis. Child Dev. **73**, 916–934 (2002)

H. Paik, G. Comstock, The effects of television violence on antisocial behavior: a meta-analysis1. Commun. Res. **21**(4), 516–546 (1994)

I.S. Penton-Voak, J. Thomas, S.H. Gage, M. McMurran, S. McDonald, M.R. Munafò, Increasing recognition of happiness in ambiguous facial expressions reduces anger and aggressive behavior. Psychol. Sci. **24**, 688–697 (2013)

S. Prot, C.A. Anderson, D.A. Gentile, S.C. Brown, E.L. Swing, The positive and negative effects of video game play, in *Children and Media*, ed. by A. Jordan, D. Romer (Oxford University Press, New York, 2014a), pp. 109–128

S. Prot, D.G. Gentile, C.A. Anderson, K. Suzuki, E. Swing, K.M. Lim, Y. Horiuchi, M. Jelic, B. Krahé, W. Liuqing, A. Liau, A. Khoo, P.D. Petrescu, A. Sakamoto, S. Tajima, R.A. Toma, W.A. Warburton, X. Zhang, C.P. Lam, Long-term relations between prosocial media use, empathy and prosocial behavior. Psychol. Sci. **25**, 358–368 (2014b)

T. Rothmund, M. Gollwitzer, C. Klimmt, Of virtual victims and victimized virtues: differential effects of experienced aggression in video games on social cooperation. Personal. Soc. Psychol. Bull. **37**, 107–119

(2011)

A. Sakamoto, M. Ozaki, R. Narushima, T. Mori, K. Sakamoto, M. Takahira et al., Terebigemu asobi ga ningen no bouryoku koudou ni oyobosu eikyo to sono katei: Joshidaigakusei ni taisuru 2-tsu no shakaishinrigakuteki jikken [The influence of video game play on human violence and its process: two social psychological experiments of female university students]. Stud. Simul. Gaming **11**(1), 28–39 (2001)

M. Saleem, C.A. Anderson, Arabs as terrorists: effects of stereotypes within violent contexts on attitudes, perceptions and affect. Psychol Violence **3**, 84–99 (2013)

M. Saleem, C.A. Anderson, D.A. Gentile, Effects of prosocial, neutral, and violent video games on children's helpful and hurtful behaviors. Aggress. Behav. **38**, 281–287 (2012). doi:10.1002/ab.21428

B.E. Sheese, W.G. Graziano, Deciding to defect: the effects of video-game violence on cooperative behavior. Psychol. Sci. **16**, 354–357 (2005)

J.L. Sherry, The effects of violent video games on aggression. Hum. Commun. Res. **27**(3), 409–431 (2001)

A. Shibuya, A. Sakamoto, N. Ihori, S. Yukawa, Media bouryoku heno sesshoku, sesshoku kankyo ga kougekisei ni oyobosu choukiteki eikyou: Shougakusei heno paneru chosa [The long-term effects of media violence and its situational variables on aggression: A panel study to elementary school children]. in *Proceeding of the 45th convention of the Japanese Society of Social Psychology*, pp. 248–249 (2004)

S.B. Silvern, P.A. Williamson, The effects of video game play on young children's aggression, fantasy, and prosocial behavior. J. Appl. Dev. Psychol. **8**(4), 453–462 (1987)

S.L. Smith, K. Lachlan, R. Tamborini, Popular video games: Quantifying the presentation of violence and its context. J. Broadcast. Electron. Media **47**(1), 58–76 (1998)

S.P. Stermer, M. Burkley, Xbox or SeXbox? An examination of sexualized content in video games. Soc. Personal. Psychol. Compass **6**(7), 525–535 (2012)

E.L. Swing, C.A. Anderson, The role of attention problems and impulsiveness in media violence effects on aggression. Aggress. Behav. **40**, 197–203 (2014). doi:10.1002/ab.21519

E.L. Swing, D.A. Gentile, C.A. Anderson, D.A. Walsh, Television and video game exposure and the development of attention problems. Pediatrics **126**(2), 214–221 (2010)

K.M. Thompson, K. Haninger, Violence in E-rated video games. J. Am. Med. Assoc. **286**, 591–598 (2001)

K.M. Thompson, K. Tepichin, K. Haninger, Content and ratings of mature-rated video games. Arch. Pediatr. Adolesc. Med. **160**, 402–410 (2006)

V. Viemerö, S. Paajanen, The role of fantasies and dreams in the TV viewing-aggression relationship. Aggress. Behav. **18**, 109–116 (1992)

W. Warburton, Apples, oranges, and the burden of proof – putting media violence findings into context: a comment on Elson and Ferguson (2013). Eur. Psychol. **19**, 60–67 (2013)

B.J. Wilson, D. Kunkel, D. Linz, W.J. Potter, E. Donnerstein, S.L. Smith, E. Blumenthal, M. Berry, Violence in television programming overall: University of California, Santa Barbara study, in *National Television Violence Study*, vol. 1 (Sage, Thousand Oaks, 1997), pp. 3–268

B.J. Wilson, D. Kunkel, D. Linz, W.J. Potter, E. Donnerstein, S.L. Smith, E. Blumenthal, M. Berry, Violence in television programming overall: University of California, Santa Barbara study, in *National Television Violence Study*, vol. 2 (Sage, Thousand Oaks, 1998), pp. 3–204

W. Wood, F.Y. Wong, J.G. Chachere, Effects of media violence on viewers' aggression in unconstrained social interaction. Psychol. Bull. **109**(3), 371 (1991)

G.S. Yang, L.R. Huesmann, B.J. Bushman, Effects of playing a violent video game as male versus female avatar on subsequent aggression in male and female players. Aggress. Behav. **40**, 537–541 (2014). doi:10.1002/ab.21551

M.L. Ybarra, L.R. Huesmann, J.D. Korchmaros, S.L. Reisner, Cross-sectional associations between violent video and computer game playing and weapon carrying in a national cohort of children. Aggress. Behav. **40**, 345–358 (2014). doi:10.1002/ab.21526

F. Yokota, K.M. Thompson, Violence in G-rated animated feature films. J. Am. Med. Assoc. **283**, 2716–2720 (2000)