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Media Violence and the Development of Aggressive Behavior

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American's history of exposure to violent media has spanned more than a century, from the film *The Great Train Robbery* (Porter, 1903) to the television show *Dragnet* (Webb, 1951) to the video game *Far Cry 2* (Hocking, 2008). Through films, television shows, music, and video games people in all modern societies consume violent entertainment media on a regular basis. There is also a long history of concern that exposure to violent media might have negative consequences for viewers. In 1954, Senator Estes Kefauver's Judiciary Subcommittee investigated the role of violent television shows in juvenile delinquency and issued a warning about such shows. In 1969, the National Commission on the Causes and Prevention of Violence identified television violence as a contributor to societal violence. A 1972 report of Surgeon General Jesse Steinfeld recognized an overwhelming consensus among the Scientific Advisory Committee members that screen violence (films and television) contributed to aggressive behavior (Steinfeld, 1972). A more recent Surgeon General's report again identified television violence as an important risk factor for youth violence and discussed similar findings with violent music and video games (Satcher, 2001). A panel brought together at the request of the Surgeon General concluded that, "Research on violent television and films, video games, and music reveals unequivocal evidence that media violence increases the likelihood of aggressive and violent behavior in both immediate and long-term contexts" (Anderson et al., 2003, p. 81). A number of scientific and health organizations have reached similar conclusions. In 2000, six organizations (the American Academy of Child and Adolescent Psychiatry, American Academy of Family Physicians, American Academy of Pediatrics, American Medical Association,

American Psychiatric Association, and American Psychological Association) issued a joint statement that the research evidence "...point(s) overwhelmingly to a causal connection between media violence and aggressive behavior in some children" (Joint Statement, 2000, p. 1). The conclusions of these scientific organizations and governmental agencies justify the examination of media violence as a causal risk factor for antisocial behavior.

Aggression and Antisocial Behavior

This chapter focuses primarily on aggression and violent behavior. Within the social psychological research tradition in which most of the discussed research and theories are based, aggression usually is defined as behavior that is primarily intended to cause harm and that is carried out with the *expectation* of causing harm to an individual who is motivated to avoid that harm. This means that trying to shoot someone with a gun but missing still constitutes aggression. Breaking an inanimate object does not constitute aggression unless the intent in breaking the object was to cause harm to the owner of that object. Neither behavior that unintentionally results in harm (e.g., a car accident) nor behavior for which harm is an unintentional byproduct (e.g., a dental operation) constitute aggression.

Similarly, playing soccer assertively and with confidence is not aggression, even though many coaches and athletes use the term to describe such assertive and confident play; the primary goal usually is to win the match within the rules of the game, not to harm the opposing players. Unfortunately, some coaches and players do occasionally intend to physically harm opposing players; in such cases the behavior crosses a fine line and becomes aggressive.

Aggression is defined broadly enough to include verbal aggression (e.g., insulting someone, thereby causing emotional harm) as well as relational aggression (e.g., spreading

rumors about someone, thereby harming their social relationships). Nevertheless, most aggression research on media violence effects has focused on physical aggression (e.g., pinching, hitting, slapping, pushing, punching, choking). Violence refers to extreme forms of physical aggression, such as assault and murder. All violence is aggression, but not all aggression is violence. Neither definition makes distinctions based on the criminality of the act. Physical punishment of children may be legal, but still constitutes aggression. Even acts of violence may be legal, such as a justifiable shooting by a police officer. Nonetheless, most of the violent behaviors studied in the context of media violence are at least potentially criminal.

Other research has focused on its effects on variables believed to mediate the effects of media violence on aggression, variables such as aggressive beliefs and thoughts, aggression related emotions (i.e., anger), physiological arousal, and desensitization to violence. That is, media violence has its effects on later aggressive behavior by changing one of these cognitive, affective, or physiological mediating variables. These variables will be discussed where relevant; however, the term "aggression" refers only to aggressive behavior.

Other chapters in this volume focus explicitly on antisocial behavior. Antisocial behavior is more broad than aggression. Certain antisocial behaviors, such as lying, cheating, stealing, or destroying property, do not always fit our definition of aggression. For example, a person may steal without the primary goal being an *intending* to harm another individual, in which case it would not be considered aggression. Such behaviors have not been thoroughly studied as a potential outcome of media exposure. Nonetheless, the theoretical framework and mechanisms discussed in this chapter may be helpful in predicting and explaining these behaviors as well.

Overview

This chapter begins with a review of past media violence studies, including studies of violent television shows, films, music, and video games, along with evidence that exposure to such media can increase aggression. Some studies using various research methods and populations are summarized. The General Aggression Model (GAM) is presented to provide a theoretical framework for understanding how media violence can lead to specific episodes of aggressive behavior as well as how these episodes create long term individual changes in a person's general aggressiveness. The possible role of executive control as a mechanism in media violence effects on aggression is also discussed.

Past Media Violence Effects Research

Research Designs

Research on media violence effects can be divided into three broad types of research designs: experimental studies (laboratory or field), cross-sectional correlational studies, and longitudinal studies. Each design has strengths that can complement the weaknesses of the other designs.

Experimental studies provide the strongest evidence of causality (i.e., media violence *causes* an increase in aggression). Because participants in experimental studies are randomly assigned to different conditions (e.g., viewing a violent film or viewing a non-violent film) these groups tend to be equivalent on any pre-existing individual difference variables. This allows researchers to eliminate almost all alternative explanations for the results, which greatly strengthens the causal argument. The primary limitation of experimental research designs is that, for ethical reasons, researchers cannot study the most serious forms of aggression (i.e., violence) in these studies.

Cross-sectional correlational studies allow researchers to measure participants' past behavior, including severe forms of aggression (violence) than cannot be used in experimental studies. A well designed cross-sectional study also can test and therefore eliminate some alternative explanations (alternatives to the causal hypothesis under investigation), for example, by including covariates in analyses of the relationship of interest. Nonetheless, researchers cannot anticipate and address all potential alternative explanations through a cross-sectional study, so this research is weaker in terms of drawing causal conclusions.

Longitudinal designs allow researchers to examine how a causal candidate variable measured at one point in time predicts changes in an individual's aggression measured at a later time, controlling for level of aggression at the earlier time. A well designed longitudinal study allows stronger causal conclusions than a cross-sectional study because it controls for all alternative explanatory variables that impinged upon the earlier aggression measure. Furthermore, the longitudinal design has the potential to examine serious forms of aggression. The primary limitation of longitudinal studies is that they are expensive and time consuming, limiting the extent to which they are used.

Each research design has its place in the study of the effects of media violence on aggressive behavior, and strong causal conclusions depend on consistent results across each of these designs. This consistency across designs provides a compelling case that the causal effects observed among milder forms of aggression are also true for more severe forms of aggression. Because hundreds of studies have been conducted on media violence effects, we cannot here report a comprehensive review (see Anderson et al., 2003). Instead, the following sections provide representative examples of each of the different types of research designs for each type

of media.

Film & Television

Violent television and film effects have been studied the longest and, consequently, constitute the largest area within the media violence research literature. More studies have been conducted on such "passive" screen media than on all other types of media violence combined.

Experimental studies. An experimental study of 5- and 6-year-old children in Finland randomly assigned half of these children to watch a violent film and the other half to watch a non-violent film (Bjorqvist, 1985). The children were then observed by raters as they played together in another room. These raters were unaware of which type of film the children had viewed. Those children who had viewed the violent film were more likely to engage in physical aggression (e.g., hitting other children, wrestling) than those who viewed the non-violent film. In another study, 7- to 9-year-old boys were randomly assigned to watch a violent film or a non-violent film (Josephson, 1987). Next, the boys played floor hockey. Half of the boys in each film condition were assigned to have hockey referees who carried walkie-talkies (half had no walkie talkies present). This was intended to serve as a cue to the violent film's content, as the violent film also depicted walkie-talkies. The children's behavior as they played floor hockey was rated for aggression (e.g., hitting, tripping, elbowing, kneeing, pulling hair, and insulting) by observers unaware of the type of film the boys had watched. Boys who had initially tested as above average in aggressiveness, watched the violent film, and had the walkie-talkies present behaved more aggressively in the hockey game than boys in any other condition of the study.

Experiments have also demonstrated film violence effects among teenagers. In one study, a treatment center for delinquent boys in Belgium was randomly divided into three cottages

(Leyens, Camino, Parke, & Berkowitz, 1975). The boys in one cottage viewed violent films every night for five straight nights whereas the boys in the other two cottages viewed non-violent films every night for the same period of time. During this time, observers coded the boys' behavior for hitting, slapping, choking, or kicking the other boys. The boys who viewed violent films engaged in more physical aggression. A similar study among American juvenile offenders found that boys assigned to watch violent films engaged in more physical and verbal aggression than those who viewed a non-violent film (Parke, Berkowitz, Leyens, West, and Sebastian, 1977).

Experiments have demonstrated a violent film effect on aggression among individuals of college age as well. In one study, college men were randomly assigned to view either a film of a boxing match (violent) or a non-violent track meet (Geen & O'Neal, 1969). The participants then had an opportunity to deliver painful noise blasts to another student who had previously provoked them. Those who had viewed the violent film delivered more intense noise blasts than those who had viewed the non-violent film. Another study demonstrated that combining violent and sexual content was especially effective in producing aggression (Donnerstein & Berkowitz, 1981). In this study, male university students were randomly assigned to view a film containing sexual and violent content, a non-violent film containing sexual content, or a non-violent, non-sexual film. They were then able to deliver electric shocks to a woman who had provoked them. Those who had viewed the violent, sexual film delivered stronger shocks than those in either of the other two film conditions.

These studies provide examples of some of the experimental designs used to examine television and film violence effects. As with any area of scientific research, the results of

experimental studies of television and film violence vary somewhat from study to study. Meta-analytic reviews provide researchers with an effective way to determine whether an association exists and the strength of that association based on all available studies. One of the most comprehensive meta-analyses of television and film violence effects on aggression found a moderate to strong overall effect ($r = 0.38$), though this effect was smaller, though still significant, when only criminal violence was assessed ($r = 0.13$; Paik & Comstock, 1994). In other words, the available experimental research demonstrates that exposure to violent television and films increases aggression.

Cross-sectional studies. Violent television and film effects have also been examined in a variety of cross-sectional correlational studies. These studies have examined both mild and serious forms of physical aggression. One study found television violence viewing among 8-year-old boys to be associated with greater physical aggression (Eron, Huesmann, Lefkowitz, & Walder, 1972). Another study showed a significant correlation between violent television viewing among 6- to 10-year-old males and concurrent aggressive behavior (Huesmann, Moise-Titus, Podolski, & Eron, 2003). In both of these studies, the association between television violence and concurrent aggression was non-significant among the same sample in later adolescence and early adulthood (age 19 or older). However, other cross-sectional studies have found television and film violence exposure to be associated with aggressive behavior among adolescents and young adults. A study of junior high and high school students in Wisconsin and Maryland found small to moderate correlations ($r = 0.17$ to $r = 0.28$) between television violence viewing and aggressive delinquency (e.g., hitting, fighting) for both males and females (McLeod, Atkin, & Chaffee, 1972). A study of 12- to 17-year-old English boys found that high television

violence viewers engaged in 49% more acts of violence in the previous six months than low television violence viewers (Belson, 1978). Overall, the meta-analytic findings for cross-sectional studies of television and film violence effects on physical aggression against another person ($r = 0.20$) are generally consistent with the findings of experimental studies, supporting the idea that the causal effects of television and film violence extend to serious forms of aggression as well (Paik & Comstock, 1994).

Longitudinal studies. Compared with the other research designs, relatively few longitudinal studies of the effects of television and film violence exposure have been conducted. One of these studies found that boys' exposure to media violence at age 8 was associated with their aggressive behavior, based on peer nominations, 10 years later (Eron et al., 1972; Lefkowitz, Eron, Walder, & Huesmann, 1977). This association remained significant (and moderately strong) when several potentially relevant variables including childhood aggressiveness, child's IQ, family socioeconomic status, and parental punishment and nurturance, were statistically controlled. Another longitudinal study examined television violence effects in five countries, beginning in the late 1970s (Huesmann & Eron, 1986; Huesmann, Lagerspetz, & Eron, 1984; Huesmann et al., 2003). This study assessed children's violent television viewing, aggression (based on peer nominations), and several control variables from ages 6 to 8 or ages 8 to 11. For girls, early violent television viewing was associated with later aggressive behavior ($r = 0.17$) even when early aggression, socioeconomic status, and educational achievement were statistically controlled. Television exposure alone did not predict later aggression in boys, however boys who frequently watched violent television in early childhood and identified with aggressive television characters were rated by their peers to be the

most aggressive children. A 15 year follow up to this study interviewed a subsample from the United States, now their early 20s (Huesmann et al., 2003). The results in this follow up were even more clear. Television violence exposure in childhood was associated with aggression in both men ($r = 0.21$) and women ($r = 0.19$). Even when the outcome was restricted to more extreme forms of aggression (e.g., punching, beating, choking, threatening or attacking with a knife or gun) childhood exposure to violent television remained a significant predictor ($r_s = 0.17$ and 0.15 , for males and females respectively). For example, men who watched a lot of violent television as children were much more likely to report having pushed, grabbed, or shoved their spouse (42%) than those who watched very little violent television as children (22%). Though meta-analyses have not examined longitudinal studies of television and film violence separately, one meta-analysis examined longitudinal media violence studies, the majority of which were studies of television and film violence (Anderson & Bushman, 2002a). This meta-analysis found a significant longitudinal association between media violence exposure and aggression ($r = 0.17$). These findings provide further support that viewing violent films and television increases aggression and that this causal association extends from mild to serious forms of aggression.

Music

Compared to other types of media, such as television, films, and video games, there is considerably less research on the effects of violent music lyrics and violent music videos on aggression. Nonetheless, the research that has been conducted in this area can be compared to research on other types of media violence. Because relatively little research has examined this topic, some studies that measure only exposure to music in general (e.g., watching MTV, listening to rap or heavy metal music) will be presented when such studies are the most

representative studies available, as such general exposure is almost certain to be positively associated with exposure to violent music in particular (e.g., a person who listens to a lot of rap music is likely to listen to more violent rap music than a person who does not listen to rap music at all). In general, using measures of total media exposure, rather than violent media exposure, tends to underestimate of the effect of violent media on aggression. Additionally, studies using certain theoretically relevant outcomes other than aggressive behavior will also be reported, as such results are informative of likely outcomes using actual behavioral measures.

Experimental studies. Anderson, Carnagey, and Eubanks (2003) reported several experimental studies of violent music. University student participants in two of these studies were randomly assigned to listen to either a violent song or a non-violent song before completing other measures. In the first study, after listening to the song participants reported their state hostility by indicating the extent to which a series of anger related words describe them. Those who had listened to a violent song reported greater hostility than those who listened to a non-violent song. In the second study, after listening to the violent or non-violent song, participants rated how similar a series of words were. Some of these words were related to aggression (choke, fight, gun) and others were neutral (bottle, night, stick). Those who had listened to a violent song rated the neutral words as more related to aggression words than those who listened to a non-violent song, reflecting greater aggressive thinking after a listening to violent song. This pair of studies shows that violent music increases aggressive feelings and aggressive thoughts, both of which are theoretically related to aggressive behavior.

Another study randomly assigned young adult African-American males to listen to either a violent or a non-violent rap song (Johnson, Jackson, & Gatto, 1995). Those who listened to the

violent rap song were more likely to endorse a violent response to a potential conflict situation than were those who listened to the non-violent rap song. This indicates greater aggressive thinking after violent music than non-violent music.

We've found only one experimental study that examined aggressive music lyric effects on aggressive behavior (Fischer & Greitemeyer, 2006). Participants listened to either sexually aggressive or neutral music, and later decided how much hot chili sauce another person would have to eat. Because that other person had previously indicated that he/she didn't like spicy food, the amount of hot chili sauce served as a valid measure of aggression. Males who had heard the sexual-aggressive song gave more hot chili sauce to a female confederate than did participants in any other condition.

Similarly, researchers in a psychiatric inpatient ward noted that aggressive behavior decreased significantly when MTV (Music Television) was removed from the ward (Waite, Hillbrad, & Foster, 1992). Because much MTV content was violent at the time of the this study, it provides further evidence that the findings for violent music effects on aggressive affect and cognitions may extend to aggressive behavior as well.

Cross-sectional studies. There are very few cross-sectional correlational studies of violent music. Research on music preferences has revealed associations between preference for certain types of music and aggression. For example, college students who prefer heavy metal music tend to have more negative attitudes towards women, whereas college students who prefer rap music tend to be more distrustful (Rubin, West, & Mitchell, 2001). These hostile attitudes could theoretically lead to greater aggression. Other researchers have found associations between the preference for rap or heavy metal music and worse academic performance, behavioral

problems in school, sexual activity, and criminal behavior (Took & Weiss, 1994). An unpublished study summarized by Roberts, Christenson, and Gentile (2003) showed that time spent watching MTV among third, fourth, and fifth grade students was associated with more physical fights. Peers and teachers rated those who watched more MTV as physically and relationally aggressive.

In sum, the existing experimental and cross-sectional studies provide some evidence that violent music increases aggression and aggression-related internal states, but the evidence is quite limited. Furthermore, there aren't any longitudinal studies of violent music effects. Thus, conclusions about the effects of violent music must be more tentative than those made for other types of violent media. The tentativeness is not due to studies failing to find music lyric or music video effects; rather, there simply have been too few studies.

Video Games

Violent video games have a history of over 30 years, dating back to games such as Air-Sea Battle, for the Atari 2600 (Kaplan, 1977). The violence depicted in video games became considerably more intense in graphics during the 1990s, when games such as Mortal Kombat and Doom were released (Boon & Tobias, 1992; Romero, Petersen, & Hall, 1993). Compared to violent television and films, violent video games are relatively new and received research attention more recently. Consequently, there are fewer studies examining the effects of violent video games. Nevertheless, research on the effects of violent video games has flourished in recent years, and has yielded clear results.

Experimental studies. In one study, 7- and 8-year old boys were randomly assigned to play either a violent video game or a non-violent video game (Irwin & Gross, 1995). Participants

were told that they would compete to be the first one to color a picture. The boy that the participant was competing with was actually a confederate (an individual working for the experimenter who behaves in a pre-determined way) who disobeyed the adult and began coloring his picture before the real participant had a marker. In other words, the confederate cheated. This situation was intended to induce frustration in the participant. The boys' aggressive behaviors toward the confederate were rated. Those who had played the violent video game behaved more aggressively toward the confederate during the frustrating situation than did the boys who had played a nonviolent video game.

Another study tested violent video game effects in a Dutch sample of adolescent boys (Konijn, Bijmank, & Bushman, 2007). Participants were randomly assigned to play a violent or non-violent video game. They also reported the extent to which they identified with their game character. After playing the game, participants completed a Competitive Reaction Time Task in which they were told they would be able to deliver harmful noise blasts to another participant (there was no actual participant). Those participants who played the violent video game selected more intense noise blasts than those who had played the nonviolent game. This was particularly true for those who highly identified with their video game character.

Experimental studies have also examined violent video game effects in young adults. For example, one study assigned male and female university students to play one of three versions of a racing video game (Carnagey & Anderson, 2005). In one version, participants were rewarded for violent behavior, such as running over pedestrians in their car. Another version punished violent behaviors. In the third version of the game, there were no pedestrians and violence was not possible. Participants then completed a Competitive Reaction Time Task similar to the task

used by Konijn et al. (2007). Those participants who had played the video game that rewarded violence delivered louder noise blasts to their (fictitious) opponent than those participants who played the non-violent version of the game.

Meta-analytic reviews of violent video game effects consistently find that experimental studies yield significant effects in the $r = .20$ range (Anderson, & Bushman, 2001; Anderson, Carnagey, Flanagan, Benjamin, Eubanks, & Valentine, 2004), with methodologically better experimental studies yielding larger effects than methodologically weaker studies (Anderson, 2004). Consistent with the examples provided here, the meta-analyses find that playing violent video games causes an increase in aggressive behavior.

Cross-sectional studies. A number of cross-sectional correlational studies have examined the association between playing violent video games and various measures of aggression. One study examined the video game playing habits and aggressive behaviors of 8th and 9th graders (Gentile, Lynch, Linder, & Walsh, 2004). Those who played more violent video games were more likely to have been in arguments with teachers and physical fights. Another cross-sectional study examined media exposure, aggressive behaviors, and a variety of other potentially relevant variables among a sample of 9th-12th graders (Anderson, Gentile, & Buckley, 2007, Study 2). Violent video game exposure was assessed by asking the participants to name their favorite video games, rate how violent each game is, and report how often they play each video game. The aggressive behaviors reported included serious violent behaviors, such as attacking another person with the idea of causing serious harm or using force to get money or other things from others. Those who played more violent video games reported more mild physical aggression ($r = 0.46$) and more severe violent behaviors ($r = 0.35$) than those who were less exposed to violent

video games. The association between violent video game playing and physical aggression and violence remained significant even when sex, total time spent viewing any type of screen media, and aggressive beliefs and attitudes were statistically controlled. A similar cross-sectional study of university students (Anderson & Dill, 2000, Study 1) yielded very similar results. The aggressive behaviors assessed included the same violent behaviors measured in Anderson et al. (2007). Those who played more violent video games were also more violent ($r = 0.46$) and also engaged in more non-violent forms of delinquency, such as stealing or cheating ($r = 0.31$). Anderson's (2004) meta-analysis revealed a moderate average effect of video game violence exposure on aggressive behavior ($r = 0.27$) in the best practice studies. The results of these sample studies, as well as the meta-analytic findings, provide further evidence that the causal effect of violent video games on aggression exists outside of the laboratory and applies to serious forms of aggression as well.

Longitudinal studies. The first longitudinal study (at least among those published in English) directly tested the effect of violent video game exposure on aggressive behavior among 3rd, 4th, and 5th graders over a period of approximately five months (Anderson et al., 2007, Study 3). This study assessed violent video game exposure through the same measure as Anderson et al.'s (2007) Study 2 (i.e., how violent favorite video games are and how often each is played). Violent video game playing at the beginning of the study was associated with later physical aggression ($r = 0.40$). This association remained significant even when a variety of important variables were statistically controlled, including initial aggression, sex, race, time spent with all types of screen media. A more recent longitudinal study compared longitudinal effects of video game exposure on physical aggression as assessed in two Japanese samples and one U.S.

sample of school children (Anderson, Sakamoto, Gentile, Ihori, & Shibuya, in press). All three samples yielded significant longitudinal effects on aggression, despite differences in culture, age (12-15 & 13-18 in the Japanese samples, 9-12 in the U.S. sample), time lag (3-4 months in the Japanese samples, 5-6 months in the U.S. sample) and specific measures of video game violence exposure and of aggressive behavior.

Yet another longitudinal study provides some evidence relevant to violent video game effects on aggression. This study examined the association between media violence exposure and aggression in 6th and 7th graders over a two year period (Slater, Henry, Swaim, & Anderson, 2003). Media violence, as assessed in this study, includes how often the participant watched action movies, played video games that involve shooting a weapon, or visited Internet sites that described or recommended violence. Because the media violence measure is based in part on the frequency of playing video games that involve firing a weapon, the results of this study are relevant to the effects of violent video games. This study found that media violence was associated with later physical aggression, even when relevant variables, including earlier physical aggression, were statistically controlled. The reverse direction of causality (aggressive individuals changing to consume more violent media) was not supported by the time lag analyses. Though this study does not distinguish video game violence from other types of media violence, this study nevertheless provides longitudinal evidence that violent media exposure, based partially on video game violence, is associated with subsequent aggression. Though more longitudinal research is clearly needed on violent video game effects on behavior, these studies provide some early evidence that violent video game playing increases aggressive behavior across time outside of the laboratory.

Intervention Research. A small number of studies have examined the effectiveness of interventions targeting media violence on children's subsequent aggressive behavior. One longitudinal study of 132 second and fourth graders who viewed high amounts of violent television assigned some children to an intervention intended to reduce the effect of television violence and the other children to a neutral control intervention (Huesmann, Eron, Klein, Brice, & Fischer, 1983). Children assigned to the treatment intervention were taught that most people do not behave as violently as those in television, filming techniques and special effects allow television shows to depict violence in unrealistic ways, and learned the methods that normal people use to resolve situations of potential conflict. The children also made a video to teach other children about television violence. Those who took part in this intervention were rated as less aggressive by peers at a four month follow up than those in the control intervention, even when sex, grade, and initial aggression were controlled. Another longitudinal study of third and fourth grade students utilized an intervention intended to reduce time spent with television, films, and console video games (Robinson, Wilde, Navracruz, Haydel, & Varady, 2001). Though this intervention reduced exposure to all types of screen media (violent and non-violent), presumably this included a reduction in exposure to violent media. Children from one school received this intervention, whereas children from another matched school did not. In a seven month follow up, those who participated in the intervention were rated by their peers as less aggressive than were those children who did not take part in the intervention. Not only do these studies provide further evidence that media violence exerts a causal effect on aggressive behavior, they also provide evidence that interventions that reduce media violence exposure or teach children that media violence is unrealistic may be effective in reducing aggressive behavior.

Overall findings. Though more research is needed to examine certain types of media and utilize certain research designs, a consistent picture has emerged across the hundreds of media violence studies conducted to date. Exposure to violent media, including television, film, music, and video games, causes an increase in the probability of aggressive behavior. This association exists both inside and outside of the laboratory. Violent media can increase both mild forms of aggression and serious forms of violence. Interventions that reduce media violence exposure or teach that media violence is unrealistic can effectively reduce aggression. Alternative explanations for the association between media violence and aggression (e.g., aggressive individuals prefer violent media) cannot fully account for these findings.

Aggression Theory and Media Violence

Previous Aggression Theories

A variety of theoretical explanations have been used to explain aggressive behavior. According to social learning theory, people learn to behave aggressively by watching the aggressive behavior of others (e.g., Bandura, 1973, 1983). This is particularly true when those others are rewarded for their aggressive behavior. Several types of learning occur. One can learn specific ways to harm someone, including novel use of initially innocuous items. For example, aficionados of TV professional wrestling are likely to view folding chairs as potential weapons because of their frequent use in such TV shows. One can also learn what types of situations call for aggression. And of course one also learns a host of related attitudes and beliefs concerning aggression, many of which may be objectively incorrect, but which will influence the media violence consumer's perceptions and actions in the real world.

Social learning theory can certainly explain some types of media violence effects, as

media such as television, films, and video games all provide opportunities for people to view the behavior of others and often depict rewards for that behavior. For example, the hero of a film may be praised and rewarded for using violence against the villain. Carnagey and Anderson's (2005) study described earlier also illustrated that rewards for violence in a video game (i.e., earning points for running over pedestrians in a car) appear to increase future aggression.

Cognitive-neoassociation (Berkowitz, 1989, 1993) theory posits that aversive events such as frustrations and provocations automatically produce negative affect. In turn, negative affect automatically stimulates or primes memories and thoughts, expressive motor reactions (e.g., angry face), and physiological reactions that are associated with both fight and flight tendencies. These fight and flight associations give rise to rudimentary feelings of anger and fear. One key feature of this theory is that stimuli present in an aversive situation, even originally neutral cues, can become associated with the aversive situation and with the aggressive thoughts and feelings that were stimulated by the situation. Indeed, even in non-aversive situations originally innocuous stimuli can become associated with thoughts and feelings with which they are paired. If paired with thoughts about aggression, such stimuli themselves can cue aggressive thoughts or concepts.

Cognitive-neoassociationism is helpful in explaining many media violence findings, especially those involving cognitive priming effects. For example, in the Josephson (1987) study described earlier, the walkie-talkies that were seen in the violent boxing film became associated with ideas about violence. Later, they cued (primed) aggressive ideas (scripts) during the game of floor hockey by those boys who had previously watched the violent film and saw referees who carried walkie-talkies.

Script theory posits that individuals develop sets of highly associated concepts (i.e., scripts) that guide perception of social events and enactment of social behavior (Huesmann, 1986, 1998). As an aggressive concept becomes integrated into a particular script, activating one part of that script can lead the entire script (including the aggressive concept) to be activated, making aggression more likely. This is relevant to media violence exposure, in that media depictions should influence the content of our social scripts and the relative accessibility of various types of social scripts. If a person views television shows in which verbal insults are frequently followed by retaliation in the form of physical violence, this could become part of that person's script for how to deal with verbal insults. That person should subsequently be more likely to react violently when insulted, because the script involving violent retaliation is activated.

Figure 1 displays an associative network that includes several aggression-related concepts and a retaliation script. Indeed, many of the key breakthroughs in aggression research by scholars working in the social learning, the cognitive-neoassociation, and script traditions are illustrated in the figure. In Figure 1, several concepts are associated with "gun" in a type of knowledge schema. Furthermore, some of these concepts are also directly linked to the retaliation social script. In this figure, associations are represented by lines connecting the concepts. Thicker lines represent stronger associations, which may differ considerably across individuals because of their different life histories. Shorter lines represent greater similarity of meaning. In such associative models, when a concept is primed or activated (used), that activation spreads to related concepts. Activation spread weakens over longer distances, and spreads more easily (i.e., weakens less) on wide pathways than on narrow ones. A final major point of such models is that

the more activation a concept or a script receives, the more likely it will be used to interpret incoming information and to influence the behavioral response.

Insert Figure 1

Excitation transfer theory states that when a person experiences physiological arousal and is subsequently in a situation that produces anger before the arousal can dissipate, the prior arousal can be misattributed to the source of the anger (Zillmann, 1983). This misattribution can further increase the likelihood of aggression. This can happen in the context of media violence effects. Violent media can increase arousal (heart rate, blood pressure), as shown in the video game literature (Anderson & Bushman, 2001). Therefore, some violent media effects on aggression may be caused by the transfer (or misattribution) of arousal from violent media exposure to a subsequent provocation. This misattribution of arousal can increase the self-perception of anger, which in turn can make aggressive behavior a more likely response.

These past theories are capable of making contributions to the understanding of media violence effects on aggression, yet none of them is broad enough to explain all of the research findings. For example, excitation transfer theory cannot explain why in Carnagey and Anderson's (2005) Study 3, the violent (rewarded) video game led to greater aggression than a non-violent video game, even when these video games were equally arousing. Similarly, cognitive-neoassociationism cannot easily explain media violence effects in studies that show no difference in negative affect between those who were exposed to violent versus nonviolent media (e.g., Anderson et al, 2004). This is not a failing of these theories; each works well within its specific domain. But a broader theoretical model is useful for considering all of the relevant mechanisms and processes relevant to aggression. The General Aggression Model (GAM;

Anderson & Bushman, 2002b) integrates the various mechanisms (affective, cognitive, and arousal-based) described by many of these more specific theories of aggression.

General Aggression Model

The General Aggression Model (GAM) represents an ongoing effort to integrate the older, more specific aggression theories, such as those described above, into a cohesive broad model. Note that GAM, like its progenitors, is not specifically about media violence effects. Rather, it attempts to model a wide range of factors that influence human aggression.

GAM begins with a social episode (see Figure 2), with person and situational inputs that determine the person's present internal state (affect, cognition, and arousal). The present internal state guides appraisal and decision processes (described more fully by Huesmann's script model), which eventually lead to some type of action. The resulting behavior (potentially an aggressive behavior) exerts an influence on the current social encounter, as well as on longer term changes in the individual and that individual's typical life situations. We'll return to this point later. Briefly, each cycle and each social encounter are seen as learning trials.

Inputs

Person inputs. Everyone brings a variety of relatively stable individual characteristics with them to each episode of potential aggression that can influence their behavior in that episode. These inputs include some innate characteristics of the individual, such as sex and genetic predisposition. U.S. crime statistics generally show that males are much more likely to commit murder than are women, often by a margin of approximately 10 to 1 (FBI, 1999). Person inputs also include personality traits, such as narcissism, which can lead to greater aggression when a narcissistic individual's unrealistic positive self-view is challenged (Bushman &

Baumeister, 1998). Other person inputs include long term goals, beliefs, attitudes, values, scripts, perceptual schemata, and expectation schemata (discussed later). Furthermore, a person brings to each situation some less stable characteristics, such as their current mood state.

Situational inputs. Whether aggressive behavior occurs or not depends not just on characteristics of the individual, but also on characteristics of the immediate situation. One situational characteristic, one of the most powerful instigating factors for aggressive behavior, is provocation (Berkowitz, 1993; Geen, 2001). There are many forms of provocation, such as verbal aggression (e.g., insults), physical aggression, or interfering with a person's attainment of a goal. Another situational factor with the potential to increase aggression is frustration. Frustration occurs when there is an impediment to one's goal. This can lead to aggression when another person is identified as the source of that frustration. Frustration even leads to aggression when the source of frustration is fully justified in their behavior (Dill & Anderson, 1995) or against someone who is not responsible for the initial frustration at all (Geen, 1968; Miller, Pedersen, Earleywine, & Pollock, 2003). Pain and discomfort also increase the likelihood of aggression. Unpleasant conditions from immersing a hand in ice water (Berkowitz et al., 1981) to hot temperatures, to loud noises, or even unpleasant odors can increase aggressive behavior (Berkowitz, 1993). This effect appears to be primarily dependent on anger, though aggressive thoughts or arousal may also be involved (Anderson, Anderson, Dorr, DeNeve, & Flanagan, 2000).

Another major situational influence on aggression is the presence of aggressive cues (Carlson, Marcus-Newhall, & Miller, 1990). For example, the presence of weapons in a situation can increase aggressive behavior through the priming of aggressive thoughts (Berkowitz &

Lepage, 1967). Even pictures of weapons or weapon words are sufficient to prime aggressive thoughts (Anderson, Benjamin, & Bartholow, 1998) and aggressive behavior (Bartholow, Anderson, Carnagey, & Benjamin, 2005). Similarly, media violence probably increases aggression at least in part by acting as an aggressive cue. Research has demonstrated that violent television shows, films, and video games are capable of priming aggressive thoughts (e.g., Anderson & Dill, 2000; Bushman, 1998).

The use of drugs is another situational input that can influence the expression of aggressive behavior. Drugs such as alcohol or caffeine can increase the probability of aggressive behavior (Bushman, 1993). These drugs may indirectly increase aggression by making the effect of other aggression-enhancing inputs (e.g., provocation, frustration, or aggressive cues) much stronger while people are under the influence of drugs (Bushman, 1997).

Person and situation variables often combine interactively in their influence on aggression. For example, Bartholow et al. (2005) found that pictures of assault guns increased the aggressive behavior of hunters more than did pictures of hunting guns, whereas the opposite pattern occurred for non-hunters. The explanation for this intriguing finding lies in the mediating processes described in later portions of GAM.

Present Internal State

All of the person and situational variables together determine an individual's present internal state (Anderson & Bushman, 2002b). This present internal state consists of three components: affect, cognition, and arousal. The lines between each of these present internal state variables in Figure 2 reflects that these variables are interrelated. Each component is influenced not only by the person and situational inputs, but by the other components of the present internal

state as well. Also, more than one of these routes may be important in a particular situation.

Affect. Some input variables increase aggression primarily through their influence on affect. Pain increases aggression most directly through anger and state hostility (Berkowitz, 1993; K. B. Anderson, Anderson, Dill, & Deuser, 1998). There is also considerable evidence that violent media increases aggression related affect, especially in short term contexts (Anderson & Bushman, 2001). This suggests the possibility that violent media increases aggression at least in part by producing feelings of anger and hostility. There are also stable individual differences in how readily one becomes angry or hostile. For example, measures of hostility as a stable trait tend to be associated with measures of an individual's current state hostility (e.g., K. B. Anderson et al., 1998).

Cognitions. Another route by which person and situational inputs can produce aggression is through cognitions. Input variables may combine to produce aggressive priming, a temporary increase in the accessibility of aggressive thoughts, concepts, and scripts. Media violence exposure can prime aggressive cognitions, indicating that this is another potential route by which media violence may lead to aggressive behavior (Anderson & Dill, 2000; Bushman, 1998). The more frequently an aggressive thought is activated, the more easily it can be activated in the future (Sedikides & Skowronski, 1990). The different effects of hunting versus assault guns on the aggressive behavior of hunters and non-hunters results from their differential effects on aggressive thoughts (Bartholow et al., 2005). For hunters, assault weapons produce more aggressive thoughts than do hunting guns, presumably because they associate hunting with enjoyable outdoor activities with family and friends and they associate assault guns with war, terrorism, and violent crime. For non-hunters, however, hunting guns inspire greater aggressive

thinking than assault guns, for reasons that are not entirely clear. In any case, these differential effects on aggressive thoughts lead to the opposite patterns of gun cue effects on aggressive behavior.

Arousal. Person and situational inputs can heighten physiological arousal. Physiological arousal can lead to aggression in different ways. Arousal tends to increase the dominant response tendency, so individuals who have a history of aggression in the situation they are presently in will tend to become aggressive when they experience heightened arousal, especially if other predisposing factors (e.g., provocation) are present (Geen & O'Neal, 1969). Arousal can also increase aggression if arousal from one source (e.g., exercise, exposure to media violence) is misattributed to another source, such as a person who gives some sort of provocation. Research has demonstrated the potential for such misattributions of arousal to produce aggression (Zillman, 1983; 1988).

Appraisal and Decision Processes

The affective, cognitive, and arousal present internal state variables combine to influence an individual's appraisal of their current situation (Anderson & Bushman, 2002b). For example, an individual might decide that another person has pushed them too far. This immediate appraisal can produce a decision and behavior without the person even being aware that he has made a decision. This could be described as an impulsive action. In other cases, the individual may have the resources and the motivation to reappraise the current situation, searching for information that gives the situation a different meaning, possibly arriving at a different, more thoughtful decision. A reappraisal depends on both sufficient cognitive resources (time to think, ability to think) and sufficient motivation (the outcome of the situation must be sufficiently

important). If either of these conditions are not met, the individual will reach a decision and behave based on their immediate appraisal.

More deliberative reappraisals do not always lead to less aggression than the immediate appraisal would have instigated. In some circumstances reappraisal leads to a more conscious decision to behave aggressively. In most social situations, however, our society provides negative outcomes for aggressive behavior, so more thoughtful decisions probably tend to be less aggressive than impulsive decisions. There are exceptions to this, of course, as some environments (e.g., being with a gang) actively encourage aggression (e.g., against intruders).

Once these appraisal and decision processes are complete, the individual engages in some behavior (potentially an aggressive one) in the present situation (Anderson & Bushman, 2002b). These components, from the person and situational inputs to the present internal state variables to the appraisal and decision processes and the resulting behavior, constitute a single aggressive episode. This episodic portion of GAM explains how aggressive behavior is produced in the short term. As mentioned throughout the description of GAM, the single episode portion of GAM specifies several ways in which violent media exposure could lead to the short term increases in aggression observed by researchers. It might prime an individual's aggressive scripts or other thoughts. It might increase an individual's anger or hostility. It might lead to aggression through arousal, either by increasing the dominant response tendency (the individual may not have the ability to engage in reappraisal of the situation when highly aroused) or it might be misattributed to another source, heightening anger. Though such short term increases in aggression are important, long term increases in aggressive personality may be of even greater importance.

Long Term Aggression Processes

According to GAM, the outcome of each aggressive episode exerts an influence on the inputs of future aggressive episodes (Anderson & Bushman, 2002b; Anderson & Carnagey, 2004). For example, if a person behaves aggressively and is rewarded by receiving compliance or respect (or points in a video game), then they will develop more favorable attitudes towards using aggressive behavior. Over the course of observing (TV, film) and enacting (video games) 10s of thousands of aggressive and violent acts, most of which are rewarded, a person's beliefs and attitudes towards aggression, their perceptual schemata, their expectations about other people, their behavioral scripts, and their typical emotional reactions to scenes and thoughts of violence can all change in an aggression-enhancing direction.

The outcome of an aggressive episode can also influence future situational input variables as well. Successful aggressive episodes lead to more aggression, which in time changes the expectations that others have for the now-aggressive person, and thereby changes the types of individuals who are willing to associate with him or her. Aggressive individuals tend to associate with other aggressive individuals, in part because nonaggressive people don't like them. Similarly, aggressive escalation processes tend to cause repeated aggressive encounters with the same individuals over time, with the seriousness of the aggression also increasing (Anderson, Buckley, & Carnagey, 2008). In sum, media violence can increase the person's general preparedness to aggress (i.e., aggressive personality) and increase the aggression potential of the person's social environment.

Aggressive personality. GAM identifies a variety of knowledge structures that can be changed through repeated aggressive episodes, but also predicts aggression in the long term.

These include aggression related beliefs, attitudes, values, scripts, perceptual schemata, and expectation schemata. These knowledge structures can be regarded as the components of aggressive personality (see Figure 3). Certain beliefs, attitudes, and values can be important person inputs to potentially aggressive social episodes. To the extent that a person believes that aggression is likely to be effective, they will be more likely to use aggression (Bandura, 1977). Various attitudes are also associated with the probability of certain aggressive behaviors. Attitudes towards violence against women are associated with both sexual and nonsexual aggression against women (Anderson & Anderson, 2008; Malamuth, Linz, Heavey, & Barnes, 1995). Other attitudes are associated with more aggressive behavior in a variety of contexts, including attitudes towards violence in war, corporal punishment of children, violence in intimate relationships, and violence in the penal code system (e.g., Anderson et al., 2007, Study 2). Some personal values are relevant to aggressive behavior. For example, individuals from certain cultures (e.g., the American south) place a high value on personal honor and answering insults to personal honor. This cultural value is often associated with greater aggressive behavior (Nisbett & Cohen, 1996).

Other aggression related knowledge structures include scripts, perceptual schemata, and expectation schemata. Scripts, as described earlier, are a set of associated concepts that become associated through repeatedly being activated together. Scripts follow principles of cognitive-associative models of memory (e.g., Collins & Loftus, 1975), as we illustrated and described earlier.

Schemata are knowledge structures that organize knowledge about about a subject in a way that guides expectations and perceptions. Perceptual schemata are those schemata that

organize information about a perceptual target. One way in which perceptual schemata are relevant to media violence effects is through facial emotion perception. Individuals differ in how quickly they are to identify happy and angry faces. Recognizing angry, but not happy faces, relatively fast may be an indication that an individual tends to automatically perceive greater hostility in others. Research has found that individuals who play more violent video games identify angry faces more quickly than those who do not play violent video games (Kirsh, Mounts, & Olczak, 2006).

Expectation schemata organize information in a way that guides expectations for different situations. For example, some children are more likely to attribute hostile intentions to ambiguous behavior than others (Crick & Dodge, 1994; Dodge & Coie, 1987). This hostile attribution bias is positively associated with violent video game playing as well as greater likelihood of aggressive behavior (Anderson et al., 2007, Study 3).

A final component of aggressive personality is emotional desensitization to violence. Desensitization to violence refers to a reduction in the normal emotion-related physiological reaction to viewing violence. The normal human reaction to violence is negative emotion (fear, disgust) and increased arousal (Cantor, 1994; 1998). It is only through experience that this negative emotional reaction to violence is eliminated. Viewing violent media leads to desensitization to later violence (e.g., Carnagey, Anderson, & Bushman, 2007; Linz, Donnerstein, & Adams, 1989). Of course, desensitization is desirable in certain contexts. Systematic desensitization is used to treat conditions such as post-traumatic stress disorder (Pantalon & Motta, 1998). Similarly, medical students must get desensitized to the sights, sounds, and smells of the operating room, and soldiers must get desensitized to the horrors of

combat. In both cases, the blunting of normal negative emotional reactions is crucial to successful performance in those situations. However, desensitization to violence in the general population is a generally undesirable outcome because GAM predicts that such desensitization will lead to a greater likelihood of initiating aggression, the use of more severe forms of aggression, greater persistence in using aggression, and a decline in helping victims of violence (Bushman & Anderson, in press; Carnagey et al., 2007).

General Learning Model. GAM provides a useful framework for understanding how media violence produces both short term and long term increases in aggression. The General Learning Model (GLM) is similar to GAM in its focus on inputs, present internal state, and outputs in the short term and long term change through repeated encounters, yet it is modified to apply to a broader range of phenomenon (Buckley & Anderson, 2006). This model may prove to be a useful framework for making predictions for research that could extend the existing findings of media violence effects on aggression to other outcomes of interest. For example, GLM might be useful in predicting and explaining how some types of media might cause increases in non-aggressive forms of delinquent and antisocial behavior.

Executive Control

Another mechanism of potential relevance to the effects of media violence on aggression is executive control. People often need to inhibit their automatic responses in situations in their daily life by exerting executive control. Executive control seems to fit most closely into the appraisal and decision making processes portion of GAM. There is some early evidence that screen media exposure of all types (TV, movies, video games) may lead to reduced executive control. This effect may be larger for violent screen media.

The Stroop interference task is commonly used to measure individual differences in executive control. In the standard Stroop task, the participant views a set of words displayed in different color inks, and names the ink color of each word as quickly as possible when it appears on a computer screen. Some of the words are color words (e.g., red). On some trials the word matches the ink color (the word "red" displayed in red) whereas on other trials the word and ink color do not match (the word "red" displayed in blue). It is much more difficult to name the ink color when there is a mismatch, because one must suppress saying the word name. This requires executive control. There are many varieties of Stroop interference tasks, some using words, others using numbers.

One recent study found that adolescents who played lots of violent video games performed more poorly on a counting version of the Stroop task than matched adolescents who played few violent games (Mathews et al., 2005). This study also included a sample of participants who had previously been classified as having Disruptive Behavior Disorder with aggressive symptoms. This group also performed poorly on the counting Stroop task, much like the high violent gamers, suggesting a possible role of violent media in lack of executive control and in aggressive behavior.

An experimental study assigned young adult participants to play a violent or non-violent video game and then to complete an emotional Stroop task (Kirsh, Olczak, & Mounts, 2005). Those assigned to the violent video game showed greater interference on this Stroop task for the negatively valenced words than did participants who had played the non-violent video game. In other words, participants who played a violent video game were less able to ignore the meaning of negative words (e.g., rage, murder) and focus on the color of the text as the task required them

to do. These studies provide some preliminary evidence that screen media exposure, particularly violent video games, may be leading to decreased executive control; these findings appear to have some implications for aggressive behavior.

Conclusions

A considerable number of studies have examined the potential effects of violent media exposure on aggression. Overall, this research, whether it was conducted with violent television, films, music, or video games, has consistently found that exposure to violent media is associated with aggressive behavior and with other theoretically relevant outcome measures. There is strong evidence that this media violence effect is causal and applies to laboratory measures of aggression and both mild and serious forms of aggression outside of the laboratory. The General Aggression Model (GAM) provides a framework for explaining these media violence effects on aggression. According to GAM, existing individual differences and characteristics of the situation determine the person's thoughts, feelings, and level of arousal. These internal states serve as inputs to appraisal and decision processes that ultimately determine what type of behavior is enacted. Within the framework of GAM, media violence can produce short term increases in aggression by increasing the accessibility of aggressive thoughts, making a person feel angry or hostile, or increasing the person's physiological arousal. Long term changes in aggressive personality are the result of repeated aggressive episodes that exert an influence on the individual's aggression related attitudes, beliefs, and values, aggressive scripts, perceptual and expectation schemata, and produce desensitization to violence. Violent media may also increase aggressive behavior by reducing an individual's ability to exert executive control in the short term or long term, and by changing the situations and types of people that are routinely

encountered.

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Figure Caption

Figure 1. Simplified associative network with aggression concepts and a retaliation script. (from Anderson, Bartholow, & Benjamin, 1998).

Figure 2. The general aggression model episodic processes (Anderson & Bushman, 2002b).

Figure 3. The general aggression model personality processes (Anderson & Carnagey, 2004).

Figure 1.

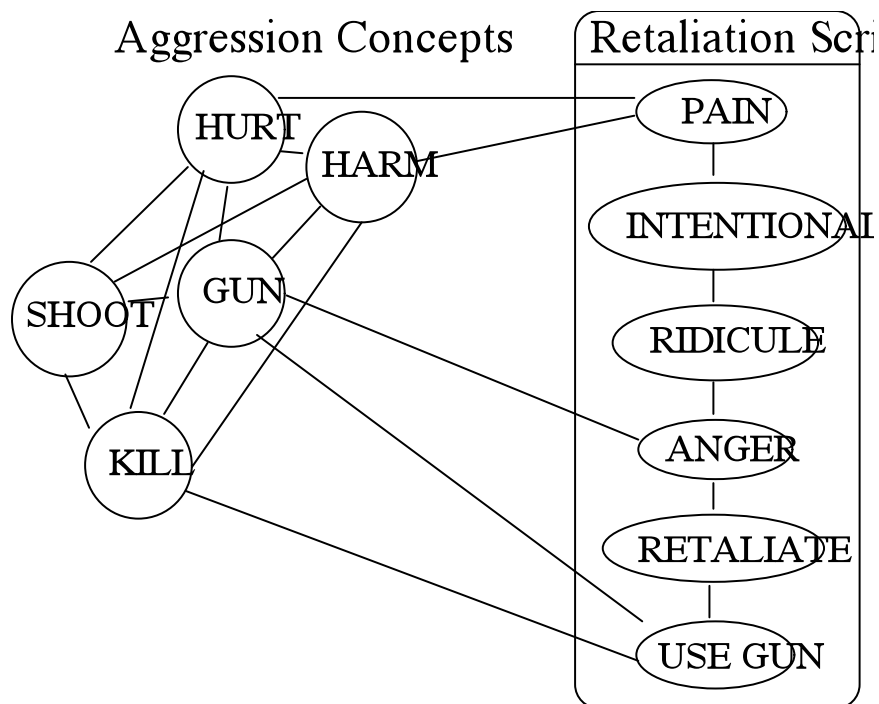


Figure 2.

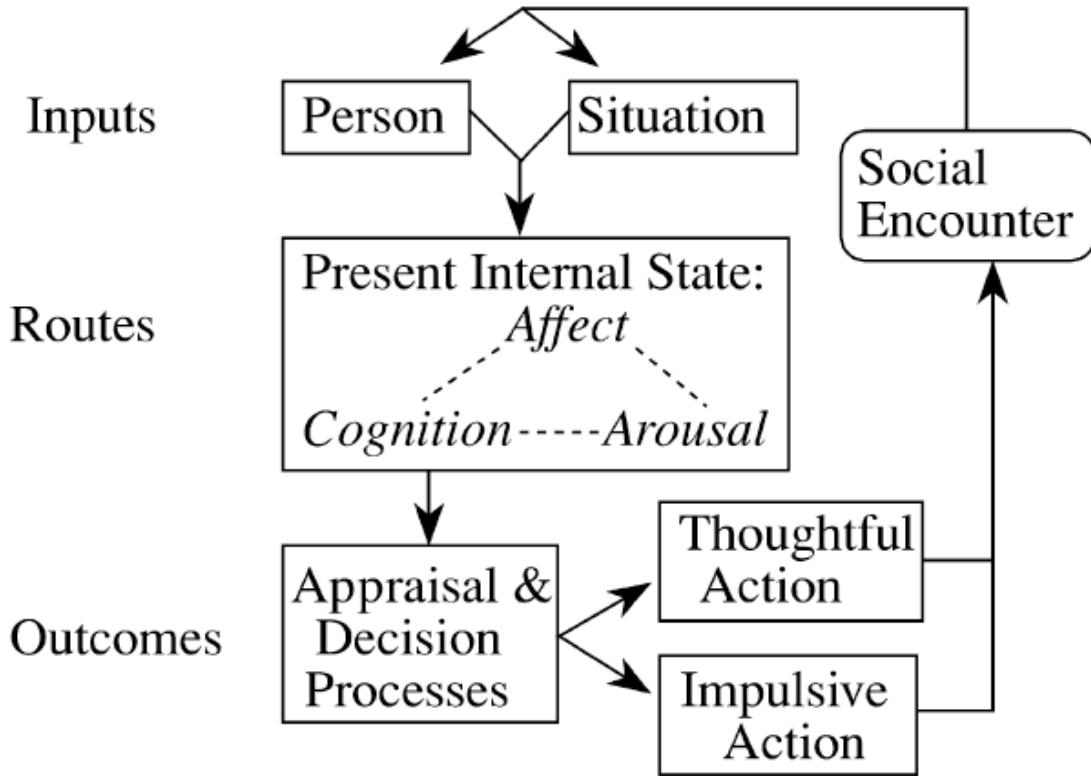
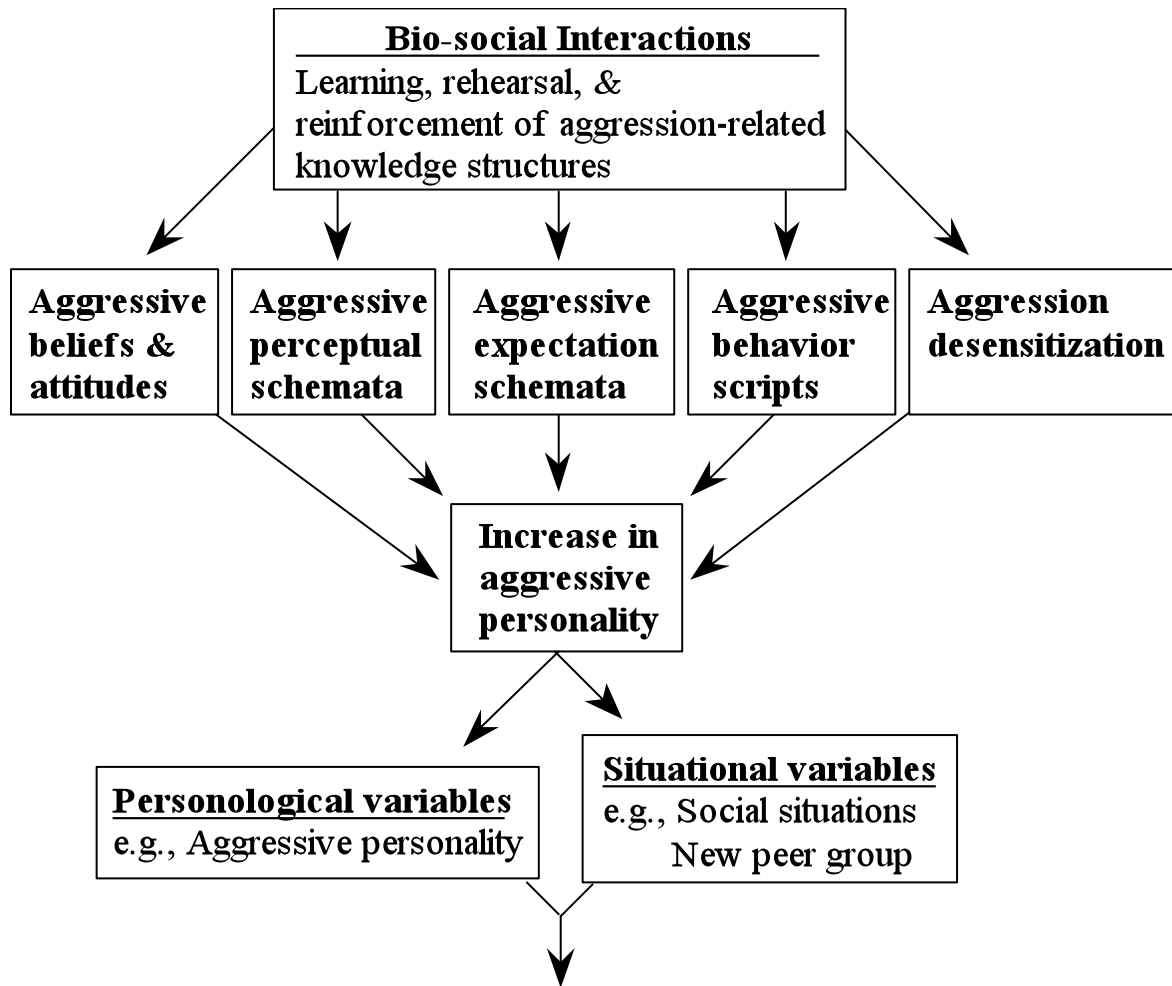


Figure 3.



General Aggression Model, as in Figure 2