Understanding Causality in the Effects of Media Violence

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Brad J. Bushman[1,2] and Craig A. Anderson[3]

Abstract

This article places media violence research into a broader context than the typical public debate about whether violent video games (or TV programs, or movies) are "the" cause of school shootings and other extreme acts of violence. We describe how scientists today decide whether one variable (e.g., exposure to violent media) increases the risks for, contributes to, or causes another (e.g., aggressive or violent behavior). We discuss the different research methods used to examine the relationship between exposure to violent media and aggressive and violent acts. We review research evidence on the link between exposure to violent media and aggressive behavior, violent behavior, and other undesirable behavior (e.g., less helping, less empathy and compassion for others). We conclude that although exposure to violent media is not "the" cause of aggressive and violent behavior, it is an important risk factor that can contribute to more aggressive and violent behaviors, and fewer prosocial behaviors.

Keywords

media violence, aggression, video games, television, causality

Public debate on the link between violent media and youth violence can become especially contentious in the wake of a shooting rampage. In many rampage shootings, the perpetrator puts on a uniform (e.g., hockey mask, trench coat, movie costume, military uniform), as if following a media script. The perpetrator then collects several guns and ammunition, goes to a public place, kills as many people as possible, and then often kills himself (or is killed by the police). It is tempting for the news media to conclude

[1]The Ohio State University, Columbus, OH, USA
[2]VU University Amsterdam, Amsterdam, The Netherlands
[3]Iowa State University, Ames, IA, USA

Corresponding Author:
Brad J. Bushman, School of Communication, The Ohio State University, 3016 Derby Hall, 154 North Oval Mall, Columbus, OH 43210, USA
Email: bushman.20@osu.edu

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that violent media caused the shooting rampage, or that mental illness caused it, or that drug use caused it, or that easy gun access caused it.

In each case, the focus tends to be on one and only one "cause." However, violent criminal behavior is almost never the result of a single cause. Human violence is a complex phenomenon that results from a convergence of multiple causal risk factors. Some factors, such as easy access to guns and to the intended targets, enable the violence. Motivating factors involve current and recent situational factors such as perceived provocations. Inherent factors involve personality characteristics of the perpetrator, which themselves are influenced by host of biological (e.g., certain genetic or brain chemistry factors) and life events (e.g., parental abuse, habitual exposure to media violence; Anderson & Bushman, 2002a). Thus, any claim that a single risk factor was "the cause" of a violent episode may make for a good news story, but it is overly simplistic.

Complicating this discourse is differing definitions of causality, aggression, and violence. Researchers understand causality as a probabilistic risk factor that can increase the likelihood of a particular negative outcome, but the general public often perceives causality as a single "cause" that has a consistent "one-to-one" relationship with the outcome. The nature of news articles does not permit the necessarily complex explication of scientific definitions of *aggression* and *violence* or of the probabilistic nature of causality when applied to complex human behaviors. Translating the language of science through the lens of the popular press, when combined with our natural tendency to seek clear and manageable answers to unimaginable events, has resulted in a public debate that has diverted attention from the critical question that parents and society must ask, "Is the risk of playing or viewing virtual violence justified by the benefit of that experience?" Attempts to answer this question with scientific evidence are bound to fail, because the question is not just scientific, but is laden with personal values as well (Anderson & Gentile, 2008). A better question to ask, from a scientific standpoint, might be, "Is exposure to violent media content a risk factor that can contribute to unwarranted aggressive and violent behavior?" Once science answers this question, the general public will be in a better position to ask the value-relevant public policy questions concerning what to do (if anything) about this ubiquitous risk factor. We will attempt to answer the scientific question in this article. Before we do, however, it is important to define the terms "aggression" and "violence."

Definitions of Aggression and Violence

Since the general public and researchers may use the terms differently, it is useful to define the terms *aggression* and *violence*. Lay people may describe a salesperson that tries really hard to sell merchandise as "aggressive." The salesperson does not, however, want to harm anyone. Most researchers define human aggression as any behavior that is intended to harm another person who does not want to be harmed (Baron & Richardson, 1994). The harm can be psychological or physical.

Laypeople and researchers, even academics in different fields, define the term "violence" differently. Most researchers define violence as aggression that has as its goal

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extreme physical harm, such as injury or death (Bushman & Anderson, 2001). For example, a child intentionally pushing another off a tricycle is an act of aggression, but not an act of violence; a person intentionally hitting, kicking, shooting, or stabbing another person is an act of violence. All violent acts are aggressive acts, but not all aggressive acts are violent—only those intended to cause extreme physical harm. The U.S. Federal Bureau of Investigation classifies four crimes as violent: murder, aggravated assault, forcible rape, and robbery. Psychologists and public health researchers define violence more broadly than the criminal justice system. For example, classifying other physically aggressive acts intended to harm, such as slapping someone hard across the face, as violent. Verbal abuse of another person would not be constitute an act of violence by this definition. Although different research studies have defined *violence* in slightly different ways, the field of media violence research would benefit from standardization going forward. The definition of violence used by the Centers for Disease Control and Prevention provides a useful foundation: "the intentional use of physical force or power, threatened or actual, against another person or against a group or community that results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation" (Dahlberg & Krug 2002, p. 5).

Three additional points about the terms *aggression* and *violence* are important. First, most aggression and violence researchers view *aggression* as a behavioral continuum that ranges from very mild to very severe, with *violence* representing the severe end. In other words, *aggression* and *violence* are not two different types of behavior. *Violence* is a more specific subtype of *aggression*. This is important because it makes clear that research on aggressive behavior that is not quite severe enough to be called violent is nonetheless relevant to testing theories, making predictions, and understanding violent behavior.

Second, ethical considerations preclude the use of certain, powerful types of research studies on violent behavior. For example, we cannot randomly assign 200 first graders to play a violent or nonviolent video game and then give them guns to see which group kills the most classmates at recess. This is no different than ethical constraints in other research domains, such as the fact that one cannot randomly assign 25,000 first graders to either a lifetime of smoking or nonsmoking and then see which group is most likely to get lung cancer. Of course, experiments in which milder forms of physical aggression are the outcome variable of interest (such as pushing or hitting on the playground) can be done ethically, as can analog experiments in which the intended harm does not actually take place. In one such study (Konijn, Nije Bijvank, & Bushman, 2007), adolescent boys were randomly assigned to play a violent or nonviolent video game, after which they competed with another boy on a reaction time game, and could blast their opponent with loud noise over headphones. The boys were told that high-intensity noise blasts could cause permanent hearing damage, which fits the definition of violence. Because there was no real opponent (and because the noise levels were actually not harmful), this study meets ethical requirements. Nonetheless, ethical constraints mean that testing the much more restrictive hypothesis that violent media can increase the likelihood of violent behavior requires greater reliance on studies that either do not assess real world violence, or that use cross-sectional, case-control, or longitudinal

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research designs, not experimental designs. The one exception to this ethical restriction on experimental designs is that one can do intervention/prevention studies on very large populations (e.g., 50,000 elementary school students) in which the experimental treatment (or intervention) is designed to reduce exposure to violent media, and the control condition does not get this intervention. In theory, one could follow up both groups for 30 years or more to see if the intervention reduced violent behavior, relative to the control condition. In practice, no funding agency has ever approved such an expensive, large scale study in the media violence domain.

Third, although society is probably most concerned about extreme incidents of violence such as rampage shootings, most parents probably are not concerned that violent media will turn their child into a rampage shooter; they are correct in assuming that violent media exposure *in the absence of other causal risk factors* will not cause such extreme events. On the other hand, many parents are concerned about the effects of violent media on less extreme forms of aggression (such as getting into fights at school), and on other negative effects, such as reduced empathy, cooperation, and helping.

Probabilistic Causality in Modern Science

Neither Necessary Nor Sufficient

The old "necessary and sufficient" rules of causality commonly taught in introductory logic courses do not apply in most of modern medical, behavioral, and social science. As an example, the scientific community has known for decades that habitual tobacco smoking causes lung cancer. Even the general public now accepts this fact. However, not all people who smoke get lung cancer, and some people who do not smoke get lung cancer. The former violates the "sufficiency" rule, whereas the latter violates the "necessity" rule. In short, smoking is neither a necessary nor a sufficient cause of lung cancer. Yet we "know" that smoking causes lung cancer. The resolution to this paradox is simple. Causality in this context is probabilistic. The short statement, "Smoking causes lung cancer," really means, "Smoking causes *an increase in the likelihood of* contracting lung cancer." Similarly, when media violence researchers say that "Violent media cause aggression," they mean that "Violent media exposure causes *an increase in the likelihood of* aggression."

Probabilistic Causality

How then do scientists establish probabilistic causality? Several directly applicable ideas from the philosophy of science can provide critical understanding about how science works (see Anderson, Gentile, & Buckley, 2007; Prot & Anderson, 2013, for more detailed accounts of the following ideas).

Theory is critical. Theory construction, testing, and revision are critical aspects of scientific advancement. Theory is a cohesive set of interconnected concepts that allow the generation of testable hypotheses. A good theory (such as evolution) is one that

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summarizes large amounts of known empirical phenomena, has repeatedly generated testable hypotheses that have been confirmed, and provides a better explanation of the phenomena than alternative explanations. Almost all good theories are causal, in that they specify causal relationships among the key concepts.

Good theories develop and change over time, in response to new observations, hypotheses, and alternative explanations. Sometimes, theory building begins with observation of an event or state of affairs that gives rise to one or more hypotheses about what caused the observed event. Empirical tests are conducted, some alternative explanations are ruled out, others supported, and maybe others generated. Over the course of many observations and tests, a set of more general concepts and principles is created, eventually earning the status of a theory. But, much research begins with existing theories, as researchers attempt to clarify vague or unspecified concepts, add new concepts, test previously untested hypotheses, or expand the relevance of the existing theory into new domains.

Theories are important for many reasons. One reason is that they help researchers organize and understand large amounts of empirical data. Another is that they often generate predictions. Yet another reason is that they help researchers know where to look for interesting phenomena. Finally, a well-tested theory allows researchers to develop useful interventions for society at large.

Test/revise/test/revise cycle. Conducting science and developing theory is an ongoing, iterative process. Scientists test various aspects of a theory, and if necessary, revise it and test it again. In this sense, a scientific theory is never complete. This process eventually leads to the development of theoretical models based on sound principles that are unlikely to be invalidated by future research. For example, the general aggression model (Anderson & Bushman, 2002a) integrates a number of earlier theoretical models that were based on more than 100 years of psychological research on learning, emotion, cognition, and behavior. Such theories provide a solid foundation for interpreting findings, making new predictions, and developing interventions. Of course, specific interpretations may require modification as a result of new discoveries. But the fact that some components of the theory have survived thousands of empirical tests in multiple domains, some of which are far removed from aggression and violence, means that the overall theoretical model is very unlikely to be found to be "wrong." Nonetheless, the fact that scientific theories are always being expanded, reinterpreted, and tested means that scientists are reluctant to use the words *fact, proven*, or *truth*. This reluctance easily leads to inaccurate reporting or interpretation of scientific findings by the general news media, which in turn can lead to misinterpretations by the general public, such as, "evolution is just a theory," "global warming is disputed by many scientists," or "media violence effects are inconsistent."

Role of alternative explanations. Testing scientific theories involves creating multiple alternative explanations for a given phenomenon, followed by empirically testing them. To a great extent, establishing causality involves testing and ruling out plausible alternative explanations. "Plausible" is emphasized because the total number of

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plausible + implausible explanations approaches infinity. Only alternative explanations that are empirically testable *in principle* qualify as plausible. Technological advances create opportunities to test alternatives that were previously untestable, which is why the "in principle" aspect is important. For example, recent advances in genetics and in neuroimaging have allowed tests of numerous new hypotheses about aggression (e.g., Dodge, 2011; Kronenberger et al., 2005; West & Bailey, 2013). Alternative explanations must also have some reasonable scientific basis to qualify as plausible.

Relevant empirical tests may cast doubt on alternative explanations and thereby lend support to the target theory. Conversely, new tests may support an alternative explanation, thereby requiring theory revision. If major theory-based hypotheses are not supported by multiple tests, rejection or wholesale reworking of theory may be required (Kuhn, 1962). But such scientific revolutions are rare. In general, as the number of *plausible* alternative explanations drops, through disconfirmation or through assimilation into the theory, the confidence in the broader theory grows.

A key question concerns what is meant by a "plausible" alternative explanation. In many ways, the criteria are the same as for a good theory. The less theoretical and empirical support behind an alternative explanation, the less plausible it is. In the media violence domain, for example, one commonly offered alternative explanation of the correlation between exposure to media violence and aggression or violence in the real world is the *selection* hypothesis, that "naturally" aggressive individuals gravitate toward using violent media and that exposure to the violent media has no impact on their aggressive and violent behavior. Although there is some evidence that aggressive people are attracted to violent media (e.g., Bushman, 1995), longitudinal studies show that the link from exposure violent media at Time 1 to aggression at Time 2 is stronger than the link between aggression at Time 1 and exposure to violent media at Time 2 (e.g., Huesmann, Moise-Titus, Podolski, & Eron, 2003; Krahé & Möller, 2010). Similarly, this alternative explanation cannot account for the consistent findings from experimental studies that brief exposure to violent media cause increases in aggressive thinking, feeling, and behavior. Thus, this alternative explanation is no longer plausible given the extensive set of studies that have disconfirmed it.

Triangulation. A final key concept in establishing probabilistic causality is *triangulation.* Because there is no such thing as a perfect study, scientists rely on multiple studies that use different designs to test the same hypothesis. The idea behind triangulation is that one can get a more accurate view of a theoretically derived hypothesis from the results of multiple studies—using different research methods, conducted by different research teams, with different types of participants, using different ways of measuring and analyzing the same conceptual independent and dependent variables—than one can get by using only one method, one type of participant, and so on (Anderson, 1987; Prot & Anderson, 2013). If the results are consistent with theory across such multiple studies, it is fair to conclude that the effect is real and that the theoretical explanation is valid. Conversely, *systematic* inconsistencies suggest that further work is needed to

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either clarify the boundaries of the theory, to examine the measures and procedures more closely, or to improve the theory.

Using Research Methods to Establish Cause and Effect

The type of method a researcher uses plays a critical role in the type of inferences that can be made. Media violence researchers use three main types of research designs: (a) experiments, (b) cross-sectional correlational studies, and (c) longitudinal studies.

Experiments

An experiment has two essential features. First, the researcher has control over the procedures. The researcher manipulates the independent variable and holds all other variables constant. All those who participate in an experiment are treated the same, except for the level of the independent variable to which they are exposed. By exercising control, the researcher tries to ensure that any differences observed on the dependent variable are caused by the independent variable and not by other factors. Second, participants are randomly assigned to the levels of the independent variable. For example, if the independent variable has two levels (e.g., violent versus nonviolent video game), the researcher can flip a coin to assign participants to groups. Random assignment means that each participant has an equal chance of being in each group. By randomly assigning participants to groups, the researcher attempts to ensure that there are no initial differences between groups. For example, in an experiment in which participants are randomly assigned to play a violent versus a nonviolent video game, the average level of trait aggressiveness in the two groups should be the same before game play. One cannot say that all the people who were aggressive to begin with played the violent game, because there is a 50/50 chance that they played the nonviolent game. Random assignment is the great equalizer, especially in studies with large sample sizes.

Each type of research design has its strengths and weaknesses. The primary strength of experiments is that they allow researchers to make strong causal inferences. The primary weakness of experiments is that the settings and measures tend to be artificial. Thus, some critics argue that laboratory experiments are unrealistic. However, the term "realistic" can mean different things. The distinction between experimental realism and mundane realism is an important one (Aronson & Carlsmith, 1968). *Experimental realism* refers to whether participants get so caught up in the procedures that they forget they are in an experiment. *Mundane realism* refers to whether the setting physically resembles the real world. Laboratory experiments are generally (but not always) low in mundane realism, but they can be high in experimental realism. Experimental realism is more important than mundane realism in determining whether the results of a study will generalize to the real world (Berkowitz & Donnerstein, 1982). Experiments conducted outside of a laboratory setting, *field experiments*, typically produce similar findings. In addition, variables known to influence real world aggression and violence have the same effects on laboratory measures of aggression (Anderson & Bushman, 1997).

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Cross-Sectional Correlational Studies

Although experiments are preferable for establishing cause–effect relationships and for testing theories, sometimes they cannot be used. The researcher may not be able to exercise control over some variables, to randomly assign participants to levels of the independent variable, or to measure some behaviors—especially illegal behaviors like violent criminal behavior (e.g., homicide, rape, aggravated assault, robbery). Faced with such practical and ethical difficulties, researchers using cross-sectional correlational designs measure the variables of interest and as many potentially confounding variables as possible. Measurements are taken at only one point in time and analyzed to see if they are correlated when confounding variables are controlled.

The primary strength of cross-sectional correlational studies is that they can be used when experiments cannot be used, conducted in natural settings, and allow researchers to examine more extreme forms of behavior (e.g., violent criminal behavior). Their primary weakness is that they cannot be used to make strong causal inferences, as indicated by the familiar phrase: "correlation does not imply causation." However, correlation is a necessary prerequisite for causation. In addition, correlational studies can be used to test alternative plausible explanations, they are relevant to testing the validity of a causal theory. Indeed, the relative ease of conducting such studies and their ability to provide useful tests of causal and alternative hypotheses explains their popularity in the scientific journals.

Longitudinal Studies

A longitudinal study is like a cross-sectional correlational study except that researchers take multiple measurements on the same group of individuals over an extended period of time, sometimes several decades, revealing temporal relationships among variables within and across individuals.

Longitudinal studies allow researchers to look at long-term effects of exposure to violent media. They can allow researchers to investigate whether exposure to violent media predicts later aggression, whether aggressive individuals seek out violent media, or both. They are better at establishing causality than cross-sectional studies because they allow stronger tests of alternative explanations, especially concerning temporal order. The primary disadvantage is that longitudinal studies require considerable resources to conduct and sustain.

Review of Research on Media Violence Effects on Aggression

One of the primary public questions about exposure to violent media is whether it contributes to more aggressive and violent behavior. In the general aggression model (e.g., Anderson & Bushman, 2002a), there are three routes to aggression and violence: (a) through aggressive thoughts, (b) through angry feelings, and (c) through physiological arousal. Someone who has aggressive thoughts, who feels angry inside, and

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who is highly aroused and stressed out should be more likely to lash out at others aggressively than someone who has no aggressive thoughts, who does not feel angry, and who is calm. Numerous studies have shown that exposure to violent media can increase aggression through each of these routes (for meta-analytic reviews, see Anderson et al., 2010; Bushman & Huesmann, 2006).

Evidence from multiple studies points to both short-term and long-term increases in aggressive behaviors among those exposed to media violence (for meta-analytic reviews, see Anderson et al., 2010; Bushman & Huesmann, 2006). Experimental studies have shown that immediately after playing violent games players behave more aggressively. These experimental studies typically expose participants to violent TV programs, films, or video games for relatively short periods of time (usually about 15-30 minutes) before measuring aggression afterward. Since it would be unethical to set up an experiment where the outcome of interest is whether the participant actually harms someone, aggression is typically measured by allowing participants to give a confederate (an actor) simulated electric shocks, loud noise blasts through headphones, or very spicy hot sauce. Research has shown that these "artificial" measures of laboratory aggression are related to real-world aggression and violence (Anderson & Bushman, 1997).

Field experiments conducted in more realistic settings have produced similar results. For example, delinquent boys who were shown violent films every night for five nights were more likely than those shown nonviolent films to get into fights with other boys (Leyens, Parke, Camino, & Berkowitz, 1975), or display higher levels of verbal aggression (Sebastian, Parke, Berkowitz, & West, 1978). Similar effects have been found with nondelinquent children who saw a single episode of a violent children's television program (Boyatzis, Matillo, & Nesbitt, 1995).

However, it is not so much the immediate effects of media violence that are of concern, but rather the cumulative long-term effects. Longitudinal studies offer evidence of a relationship between exposure to violent media as a child and aggressive and violent behavior many years later as an adult. Children who have a heavy diet of violent television are more likely to behave aggressively later in life. For example, in one longitudinal study, children exposed to violent media at ages 8 to 10 years were significantly more aggressive 15 years later as young adults (Huesmann et al., 2003). Importantly, this study also found that aggression as a child was unrelated to exposure to violent media as a young adult, effectively ruling out the possibility that this relationship is merely a result of more aggressive children consuming more violent media.

Numerous meta-analyses have examined media violence effects on aggression, yielding consistent results. Some include older (TV) and newer (video games) types of screen media (e.g., Anderson & Bushman, 2002b; Bushman & Huesmann, 2006). Others focus on newer media (e.g., Anderson et al., 2010; Greitemeyer & Mügge, 2014). All of these recent meta-analyses present results for different types of research designs. Across the different designs, different research groups, and different countries, there is a convergence of evidence (i.e., triangulation) that leads to the same conclusion: Exposure to violent media increases aggression.

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Media Violence Effects on Violent Behavior

As noted earlier, ethical considerations limit the severity of outcome variables that can be used in experimental studies. Very few analog experiments have included behavioral measures that could be classified as "violent." In one experiment, participants who had played a randomly assigned violent video game behaved more aggressively on the noise blast measure than did those who had played a nonviolent game (Konijn et al., 2007). In addition, the boys in the violent game conditions who strongly identified with their violent game character aggressed at a level that they believed could cause permanent hearing loss. One boy told the researcher during the debriefing, "I blasted him with level 10 noise because he deserved it, I know he can get hearing damage, but I don't care!"

There are a number of cross-sectional and longitudinal studies that have assessed violent and other antisocial behaviors as outcome variables, with TV, film, and video game violence exposure as predictors. One of the most extensive is a longitudinal study that assessed the same group of participants from childhood to early adulthood (Huesmann et al., 2003). The adulthood composite measure of aggression included spouse abuse; violent behaviors such as punching, beating, or choking another person; and criminal behavior, both self-reported and state-reported convictions. The results showed that violent TV-viewing habits during childhood predicted violent behavior in adulthood for males and females, even after controlling for childhood aggression, parent educational status, child intellectual ability, and parent aggression, child-rearing practices, and TV-viewing habits.

One early meta-analysis included a violent outcome variable called "criminal violence against a person" (Paik & Comstock, 1994; see also, Comstock & Scharrer, 2003; Savage, 2008). Across 58 studies (of all types), there was a significant effect of exposure to TV violence on criminal violence. Across 271 studies, there was a significant effect of TV violence exposure on "physical violence against a person (nonillegal behavior)." These violent TV studies lay the foundation for later work involving violent video games. More recent studies have included exposure to violent video games in cross-sectional and longitudinal studies with violence as the outcome variable. One of the first (Anderson & Dill, 2000, Study 1), assessed violent behavior using items from the National Youth Survey (Elliot, Huizinga, & Ageton, 1985). This 10-item subscale includes attacking someone with the idea of seriously hurting or killing, being involved in gang fights, assault, and robbery. The results showed that violent video game exposure was associated with violent behavior, even after controlling for participant sex, screen time, and trait aggression. A more recent study (DeLisi, Vaughn, Gentile, Anderson, & Shook, 2013) with juvenile delinquents examined the relationship between exposure to violent video games and violent behaviors, including gang fighting and hitting a parent or student. Violent video game play was positively linked to violence, even after controlling for participant sex, psychopathy, age, race, and juvenile court onset.

Other cross-sectional studies have linked video game violence to violent behavior in elementary school (9-12 years), high school, and college participants (e.g., Anderson

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et al., 2007, Studies 1 and 2). Indeed, the largest meta-analysis of violent video game effects found that the link between exposure to violent video games and serious acts of aggression was about as strong as the link between exposure to violent video games and less serious acts of aggression (Anderson et al., 2010).

A few recent longitudinal studies have included measures of exposure to violent video games and violent behavior. One longitudinal study found that exposure to violent video games predicted violent behavior (e.g., fighting and beating) 2 years later, even after controlling for earlier aggressiveness and a host of family, school, and peer variables. The authors reported that, "playing violent electronic games is the strongest risk factor of violent criminality" (Hopf, Huber, & Weiß, 2008, p. 79).

One study used a retrospective design to investigate the effects of media violence on a large sample of high school students and incarcerated juvenile delinquents (Boxer, Huesmann, Bushman, O'Brien, & Moceri, 2009). Violent behavior was measured using items such as, "How often since you have been a teenager have you punched or beaten someone?" The researchers also obtained reports from parents or guardians and from teachers or staff. Results showed that media violence preferences from childhood (ages 7-8 years) were significantly correlated with later violent behavior, even after controlling for participant sex and a host of violence risk factors, such as adjudicated status (high school vs. delinquent), trait callousness, academic skills, depression, psychosis, and neighborhood violence.

In sum, extant research shows that media violence is a causal risk factor not only for mild forms of aggression but also for more serious forms of aggression, including violent criminal behavior. That does not mean that violent media exposure by itself will turn a normal child or adolescent who has few or no other risk factors into a violent criminal or a school shooter. Such extreme violence is rare, and tends to occur only when multiple risk factors converge in time, space, and within an individual.

Other Violent Media Effects

Research has shown that heavy TV viewers, defined as 4 hours or more per day, are more fearful about becoming victims of violence, more distrustful of others, and more likely to perceive the world as a dangerous, mean, and hostile place than are light TV viewers (e.g., Gerbner & Gross, 1976, 1981). Research has also shown that people who consume a lot of violent media become desensitized, numb to the pain and suffering of others. After consuming violent media, people are less physiologically aroused by depictions of real violence (e.g., Carnagey, Anderson, & Bushman, 2007; Cline, Croft, & Courrier, 1973; Thomas, 1982) and less helpful toward others (for meta-analytic reviews, see Anderson et al., 2010; Bushman & Huesmann, 2006). The effect on empathy of playing violent video games is especially concerning. Feeling empathy requires taking the perspective of the victim. Television and film viewers have the choice of taking the perspective of the killer or the victim, but in violent video games, the player takes the perspective of the killer.

Increases in low-level aggression influence other developmental domains, such as school performance and peer, parent, and teacher relationships. In one 6-month

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longitudinal study (Anderson et al., 2007, Study 3), violent video game play led to increased aggression, decreased prosocial behavior, and increased hostile attribution bias, which were, in turn, linked to peer rejection. Furthermore, total screen time (violent or not) predicted poorer school grades, which was linked to greater peer rejection. In summary, increased screen media use has been linked, through increased anxiety, desensitization, and decreased prosocial attitudes and behaviors, to poorer social–emotional development.

Summary

It is important to place the public debate about whether exposure to violent screen media is "the" cause of school shootings in context with scientific findings. Our reasoning, and practical decision making for our children and our society, must be guided by six key points. First, extreme violence occurs only when multiple causal risk factors are present. Second, scientific causality is often of a probabilistic nature, not a one-to-one "necessary and sufficient" relationship. Exposure to violent media is neither necessary nor sufficient to cause aggressive and violent behavior, but it does increase the probability of aggressive and violent behavior. Third, theory is crucial for studying violent media effects. For decades, both therapists and researchers have compiled evidence showing that observing violence in the home, at school, in the community, and in the culture is harmful to children. How, then, could viewing or participating in ever more realistic screen media violence not be harmful? What psychological theory would explain how observing violence in the home, school, community, or culture would increase the risk of aggression and violence, but observing it in the media would not increase the risk? Fourth, research using different research methods, participants, and settings triangulates on the conclusion that exposure to violent media is linked to aggressive and violent behavior. Fifth, there is an extensive body of theoretically consistent empirical evidence showing that exposure to media violence is a causal risk factor for aggression. Sixth, there is also a smaller, but generally consistent body of evidence showing that media violence effects on aggression extend to more extreme forms of physical aggression known as violence.

Exposure to violent media is not the only risk factor for aggressive and violent behavior but it is an important one. Recall that we began this article by raising an important question: "Is exposure to violent media content a risk factor that can contribute to violent behavior?" The answer to this question is "yes." The more difficult question, "What should society do about this risk factor?" requires consideration of additional personal and societal values, legal issues, and practical issues (see Anderson & Gentile, 2008). It is time to move from the relatively easy scientific question, which has been answered, and toward more complex public policy question.

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Author Biographies

Brad J. Bushman is a professor of communication and psychology at The Ohio State University, where he holds the Margaret Hall and Robert Randal Rinehart Chair of Mass Communication. He is also a professor of communication science at the VU University Amsterdam, the Netherlands. He received the Distinguished Lifetime Contribution to Media Psychology and Technology Award from the American Psychological Association in 2014.

Craig A. Anderson is a Distinguished Professor of Psychology at Iowa State University and Director of Center of the Study of Violence. He is the past President of the International Society for Research on Aggression. He consistently ranks among the most frequently cited aggression scholars in textbooks and journals, and is one of the youngest scholars identified in 2014 as an "Eminent Psychologist" of the post-World War II era.

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