

Short-term and Long-term Effects of Violent Media on Aggression in Children and Adults

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Objectives: To test whether the results of the accumulated studies on media violence and aggressive behavior are consistent with the theories that have evolved to explain the effects. We tested for the existence of both short-term and long-term effects for aggressive behavior. We also tested the theory-driven hypothesis that short-term effects should be greater for adults and long-term effects should be greater for children.

Design: Meta-analysis.

Participants: Children younger than 18 years and adults.

Main Exposures: Violent media, including TV, movies, video games, music, and comic books.

Main Outcome Measures: Measures of aggressive behavior, aggressive thoughts, angry feelings, physiological arousal (eg, heart rate, blood pressure), and helping behavior.

Results: Effect size estimates were combined using meta-analytic procedures. As expected, the short-term effects of violent media were greater for adults than for children whereas the long-term effects were greater for children than for adults. The results also showed that there were overall modest but significant effect sizes for exposure to media violence on aggressive behaviors, aggressive thoughts, angry feelings, arousal levels, and helping behavior.

Conclusions: The results are consistent with the theory that short-term effects are mostly due to the priming of existing well-encoded scripts, schemas, or beliefs, which adults have had more time to encode. In contrast, long-term effects require the learning (encoding) of scripts, schemas, or beliefs. Children can encode new scripts, schemas, and beliefs via observational learning with less interference and effort than adults.

Arch Pediatr Adolesc Med. 2006;160:348-352

THE BODY OF EMPIRICAL RESEARCH linking children's exposure to media violence with subsequent increases in their aggressive and violent behavior was already substantial by the 1970s. The 1972 Surgeon General's Scientific Advisory Committee on Television and Social Behavior report¹ and the National Institute of Mental Health 10-year follow-up report² provided widely accessible summaries of this growing body of research. By the 1980s, most child development scholars had accepted the theory that exposure to media violence, at least during some periods of a child's development, increased their risk for aggression.³ However, it has only been in the 1990s and more recently that meta-analyses have provided systematic summaries of the entire body of research.^{4,5} Similarly, it has been during this time that the attention of researchers has turned more toward investigating the processes producing the effects and developing a more coherent theoretical understanding of the effects.⁶

In this article, we describe what we believe are the major psychological processes that account for the relationship between children's exposure to different kinds of violence in their world and the increase in the risk for

violence and aggression that this exposure produces. We then use meta-analyses to show that, on the whole, the available empirical data show the patterns one would expect from this theory. Although the focus of this article is on exposure to media violence, the theoretical premise is that the same processes operate when children are exposed to media violence as when they are exposed to violence on the street, in the home, or among their peers.

The psychological processes that link children's exposure to violence with subsequent increases in children's aggressive behaviors can be divided into those that produce more immediate but transient short-term changes in behavior and those that produce more delayed but enduring long-term changes in behavior. Long-term increases in children's aggressive behavior are now generally agreed to be a consequence of the child's learning scripts for aggressive behavior, cognitions supporting aggression, and aggression-promoting emotions through the observation of others behaving violently. This observational learning generally requires the repeated observation of violence. On the other hand, short-term increases in children's aggressive behavior following

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the observation of violence are owing to 3 other quite different psychological processes: (1) the priming of already existing aggressive behavioral scripts, aggressive cognitions, or angry emotional reactions; (2) simple mimicking of aggressive scripts; and (3) changes in emotional arousal stimulated by the observation of violence.

Neuroscientists and cognitive psychologists posit that the human mind acts as an associative network in which ideas are partially activated, or primed, by stimuli that they are associated with.⁷ The activation produced by an observed stimulus spreads in the network and moves even remotely related concepts closer to a threshold of influence. Thus, an encounter with an event or object can prime related concepts, ideas, and emotions in a person's memory, even without the person being aware of it.⁸ For example, the mere presence of a weapon in a person's visual field can increase aggressive thoughts or behaviors.⁹ Seeing people fight activates scripts for behavior related to fighting and other aggressive ideas. Any cognitions, behaviors, or emotions that have ever been linked to an observed violent scene will be activated within milliseconds when that scene is observed.

Human and primate young have an innate tendency to imitate whomever they observe.^{10,11} Neuroscientists have discovered "mirror neurons" in primates that seem to promote such processing.¹² Consequently, children who observe (in the media or in the environment around them) others exhibiting a specific aggressive behavior, eg, hitting, are more likely to perform the same aggressive behavior immediately.^{11,13,14} Theoretically, the more similar that children think they and the observed model are, the more readily imitation will take place, but the imitation mechanism is so powerful that even fantasy characters are imitated by young children.

Observed violence often consists of high-action sequences that are very arousing for youth as measured by increased heart rate, blood pressure, skin conductance of electricity, and other physiological indices of arousal. To the extent that media violence highly arouses the observer, aggressive behaviors may become more likely in the short run for 2 possible reasons. First, high arousal generated by exposure to violence makes any dominant response tendency more likely to be carried out in the short term. Consequently, the child with aggressive tendencies behaves even more aggressively.^{15,16} Second, when a child is highly aroused (eg, by viewing violence), a mild specific emotion (eg, mild anger) experienced some time later may be felt more severely (eg, intense anger) than otherwise because some of the emotional response stimulated by the violent media presentation is misattributed as being due to the provocation. This process is called excitation transfer.^{17,18}

By observational learning, we mean the process through which behavioral scripts, world schemas, and normative beliefs become encoded in a child's mind simply as a consequence of the child observing others. Observational learning is a powerful extension of imitation in which logical induction and abstraction are used to encode complex representations. For example, extensive observation of violence biases children's world schemas toward hostility, and they then attribute more hostility to others' actions,^{19,20} which in turn increases the likelihood of children behaving aggressively themselves.²¹ Similarly, through repeated observation

of real-life aggressive models and aggressive models portrayed in the media, children develop normative beliefs that aggression is appropriate, and they acquire social scripts for how to behave aggressively. Whereas short-term mimicry requires only 1 exposure to an observed behavior, long-term observational learning usually (but not always) requires repeated exposures. The more that the child's attention is riveted on the observed behavior, the fewer are the number of repetitions needed. However, numerous other factors besides attention affect the extent of the learning. The current conceptions of this process have grown out of the convergence of social learning theory¹³ with more recent theories of social information processing.^{19,22-25} The more that the child identifies with the observed people and the more that the observed scripts for behavior are rewarded and portrayed as appropriate, the more firmly will the scripts be encoded and the more likely it is that more general beliefs about such behaviors will be extracted and encoded.^{13,26}

This observational learning interacts with conditioning by family and peers to build behavioral scripts and social cognitions that are highly resistant to change. The reinforcements that a child receives from imitating a positive or negative behavior strongly influence the likelihood of that behavior persisting.^{15,26} Similarly, if the world schemas and normative beliefs that a child acquires through observing others (again, in real life and in the media) lead to valuable outcomes for the child, they will become more firmly encoded and more resistant to change.²⁷

The long-term effects that exposure to violence has on children also involve the vicarious conditioning of emotional reactions. Through classical conditioning, fear or anger can become linked with specific stimuli after only a few exposures.²⁸⁻³⁰ These emotions influence behavior in social settings away from the media source through stimulus generalization. A child may then react with inappropriate fear or anger in a novel situation that is similar to one that the child has observed in the media. Repeated exposure to emotionally arousing media can also lead to habituation of certain natural emotional reactions. This process is often called *desensitization*, and it has been used to explain a reduction in distress-related physiological reactivity to media portrayals of violence. Indeed, violent scenes do become less arousing over time,³¹ and brief exposure to media violence can reduce physiological reactions to real-world violence.³² Behaviors that might seem unusual to the child viewer at first will begin to seem more normative after repeated presentations. For example, most persons seem to have an innate negative emotional response to observing blood and violence as evidenced by increased heart rates, perspiration, and self-reports of discomfort that often accompany such exposure. However, with repeated exposure, this negative emotional response habituates, and the child becomes desensitized. The child can then think about and plan proactive aggressive acts without experiencing negative affect.

For both adults and children, we expect that there will be positive relationships between their degree of exposure to media violence and their subsequent short-term displays of aggressive behaviors, emotions, and ideas. Priming, imitation, and excitation transfer would all contribute to these effects.

These short-term effects should be more pronounced for adults than for children because priming depends on the prior

Table. Effects of Media Violence on Aggressive and Helpful Behavior, Aggressive Thoughts, Angry Feelings, and Physiological Arousal Levels for All of the Studies Combined*

Measure	Average Correlation (95% CI)	Studies, No.	Participants, No.	Fail-Safe N
Aggressive behavior	0.19 (0.19 to 0.20)	262	48 430	151 984
Helpful behavior	-0.08 (-0.11 to -0.04)	59	3243	157
Aggressive thoughts	0.18 (0.17 to 0.19)	140	22 967	34 447
Angry feelings	0.27 (0.24 to 0.30)	50	4838	8654
Physiological arousal	0.26 (0.20 to 0.31)	27	1356	927

Abbreviation: CI, confidence interval.

*Physiological arousal includes, for example, increased heart rate and blood pressure.

existence of a well-encoded network of aggressive scripts, beliefs, and schemas. The development and elaboration of such networks require time and repeated learning experiences, so adults are more likely to possess well-elaborated, rich networks of associations involving aggressive scripts, beliefs, and schemas. Consequently, observations of violence by adults will prime a set of related aggressive constructs larger than that for children and will prime them more rapidly.

There should be positive relationships for both adults and children between their degree of exposure to media violence earlier in life and their subsequent long-term displays of aggressive scripts, beliefs, and schemas. Observational learning of scripts, schemas, and beliefs and the desensitization of negative emotional reactions to violence are the 2 processes that contribute to these effects.

These long-term effects should be more pronounced for children than for adults because observational learning and desensitization both depend on the observer having a mind that is readily modifiable. The younger the children are, the more susceptible they should be to encoding aggressive scripts, schemas, or beliefs through observational learning; also, the younger the children are, the more quickly their emotional responses to observing violence should habituate. For adults, learning new scripts, schemas, and beliefs requires replacing old ones, and the process is likely to take longer and require the observation of more powerful scenes. In the rest of this article, we examine whether meta-analyses of the accumulated empirical data on media violence are consistent with these predictions.

METHODS

DATA SOURCES

To retrieve relevant studies, we searched the PsychINFO database from 1887 (starting date) to 2000 using the terms *violen** or *aggress** as well as the terms *TV*, *televi**, *film*, *movie*, *screen*, *music*, *radio*, *video*, *video game*, *computer game*, *cartoon*, *comic*, *pornograph**, *erotic**, *news*, *book*, *magazine*, or *sport*. The asterisk is a wild card that gives all of the possible forms of the word (eg, *aggress** searches for the terms *aggress*, *aggressed*, *aggression*, *aggressive*, *aggressively*, and *aggressor*). We restricted the search to empirical studies involving human participants. We also searched the reference sections of previous meta-analyses of violent media and aggression.^{4,33-35}

STUDY SELECTION

Two inclusion criteria were used. First, the study needed to include a measure or manipulation of violent media exposure (eg,

TV programs, films, video games, music, and comic books). Second, the study needed to include a measure of aggressive behavior, aggressive cognition, aggressive affect, physiological arousal, or helping behavior. A total of 431 studies involving 68 463 participants met these criteria. There were 264 studies involving 50 312 children and 167 studies involving 18 151 adults.

CODED CHARACTERISTICS

The following characteristics were coded for each study: (1) type of study (ie, longitudinal study, laboratory experiment, field experiment, correlational study); (2) participant age (ie, children aged <18 years, adults); and (3) type of dependent variable (ie, aggressive behavior, aggressive thoughts, angry feelings, physiological arousal, helping behavior).

Each article was coded by one of us (B.J.B.). To assess coding reliability, an additional 3 judges each coded a random sample of 50 articles. A different random sample (with replacement) was selected for each judge. There was perfect agreement among judges on coded variables.

META-ANALYTIC APPROACH

The effect size index was the correlation coefficient. Because the distribution of the correlation coefficient is not normal unless the population correlation coefficient equals 0, we applied Fisher *z* transformation to each correlation coefficient before pooling them. Each *z* score was weighted by the inverse of its variance (ie, *N*-3). Thus, larger studies had more weight computing the average correlation. Then, we transformed *z* scores back to correlations. We also computed a 95% confidence interval for the average correlation. If the 95% confidence interval excludes the value 0, the correlation is significantly different from 0.

We used both fixed- and random-effects analyses, although the 2 approaches yielded the same pattern of results. Thus, we report only the fixed-effects analyses in this article.

In a meta-analysis, it is difficult to find unpublished studies. Studies with nonsignificant effects are often not published; they end up in file drawers rather than in peer-reviewed journals. If studies in file drawers had been published, the average correlation would be smaller. "Fail-safe *N*" is the number of studies with nonsignificant correlations that are needed to reduce the average correlation to 0.³⁶ If the fail-safe *N* is large, then the results are probably not affected by publication bias.

RESULTS

OVERALL EFFECTS OF MEDIA VIOLENCE

As shown in the **Table**, there were significant, if modest, overall positive effect sizes showing that exposure to media violence was positively related to subsequent aggres-

sive behavior, aggressive ideas, arousal, and anger. Additionally, there was a significant negative effect of exposure to violence on subsequent helping behavior. Because the confidence intervals exclude the value 0, the average correlations were all significantly different from 0. Also, the fail-safe N values are quite large, indicating that the file drawer problem is not that serious.

AGE DIFFERENCES IN SHORT-TERM AND LONG-TERM VIOLENT MEDIA EFFECTS

We expected the short-term effects of violent media on aggression to be larger for adults than for children. In contrast, we expected the long-term effects of violent media on aggression to be larger for children than for adults. This pattern of results would be supported by a significant interaction between the type of study and age on violent media-related effect size estimates. We tested this hypothesis using the Statistical Analysis System (SAS Institute, Inc, Cary, NC) general linear model procedure.³⁷ Age was a dichotomous variable in the model (ie, child vs adult). Study type was also dichotomous (laboratory experiment vs longitudinal study). The analysis revealed no main effect for age ($\chi^2=0.21$, $N=166$, $P>.05$). There was a main effect for type of study ($\chi^2=14.25$, $N=166$, $P<.001$), but it was qualified by the predicted interaction between age and study type ($\chi^2=6.87$, $N=166$, $P<.009$). As can be seen in the **Figure**, media-related aggression was greater for adults than for children in laboratory studies, but it was greater for children than for adults in longitudinal studies.

COMMENT

In summary, none of our theoretical predictions about the relationship between exposure to media violence and subsequent aggression were contradicted by the meta-analytic data. As predicted, adults displayed larger effect sizes than children in short-term studies whereas children displayed larger effect sizes than adults in long-term studies. This is consistent with the theory that short-term effects are mostly due to the priming of existing well-encoded scripts, schemas, or beliefs whereas long-term effects require the learning (encoding) of scripts, schemas, or beliefs. Young minds with fewer existing encoded cognitions can encode new scripts, schemas, and beliefs via observational learning with less interference and effort than adults. Additionally, we showed that there were overall modest but significant effect sizes for exposure to media violence on aggressive behaviors, emotions, and cognitions.

There are important implications to be drawn from these conclusions for clinical practice. Although observing violence may increase aggression in the short term for adults and children, long-term effects are most likely to occur for children. Consequently, children need the most protection from repeated exposures to violence. Infrequent exposure is not likely to produce lasting consequences, but parents particularly need to be urged to protect their children against the kinds of repeated exposures that heavy play with violent video games or immersion in violent TV programs is likely to produce.

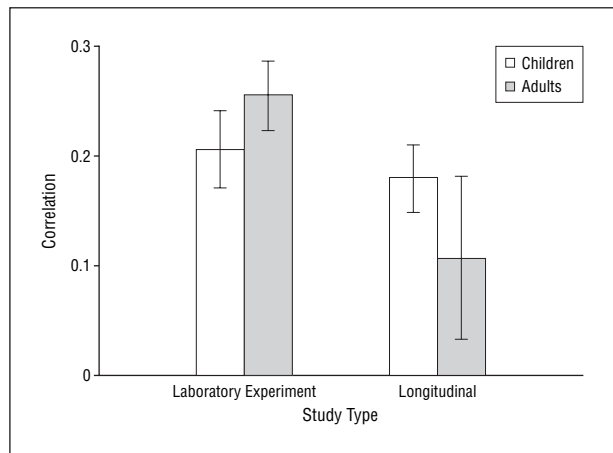


Figure. Interactive effects of age and study type on media-related aggression. Error bars indicate 95% confidence intervals.

Parents also need to realize that the size of the long-term effect that such exposure has on children will depend on the extent to which the child perceives the violence as realistic, justified, and rewarded as well as on the extent to which the child identifies with the perpetrator. Action heroes are more dangerous teachers of violent behavior than villains. Finally, parents need to be as concerned about the beliefs and attitudes that are being conveyed in violent shows as they are about their child mimicking the behaviors shown. The changes in how the child perceives the world from viewing violence and the beliefs about aggression that the child acquires from viewing violence are likely to influence the child's behavior in the long term as much as the specific scripts for aggression that the child learns from viewing violence.

Accepted for Publication: November 30, 2005.

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Announcement

Submissions. The Editors welcome contributions to Picture of the Month. Submissions should describe common problems presenting uncommonly, rather than total zebras. Cases should be of interest to practicing pediatricians, highlighting problems that they are likely to at least occasionally encounter in the office or hospital setting. High-quality clinical images (in either 35-mm slide or electronic format) along with parent or patient permission to use these images must accompany the submission. The entire discussion should comprise no more than 750 words. Articles and photographs accepted for publication will bear the contributor's name. There is no charge for reproduction and printing of color illustrations. For details regarding electronic submission, please see: <http://archpedi.ama-assn.org>.