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# Priming Effects of Media Violence on the Accessibility of Aggressive Constructs in Memory

Brad J. Bushman  
Iowa State University

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*Two experiments tested the hypothesis that violent media make aggressive constructs more accessible to viewers. In Experiment 1, participants made free associations to homonyms, with one meaning more aggressive than the other, and to nonaggressive words after viewing a violent or nonviolent video. Participants who saw the violent video listed more aggressive associations to both types of words. In Experiment 2, participants completed a lexical-decision task after viewing a violent or nonviolent video. Participants pressed one key if a string of letters was an English word, or another key if it was a nonword. Half of the words were aggressive and half were nonaggressive. Participants who saw the violent video had faster reaction times to aggressive words. Videotape content did not influence reaction times to nonaggressive words. These results suggest that violent media prime cognitive-associative networks related to aggression.*

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Film is a powerful medium. Film is a drug. Film is a potential hallucinogen. It goes into your eye. It goes into your brain. It stimulates, and it's a dangerous thing. It can be a very subversive thing.

—Oliver Stone, director of *Natural Born Killers* (in Powell & Hewlett, 1995)

Despite considerable evidence that viewing violence may facilitate the emission of aggression, theoretical explanations for such findings have tended to be limited and inconclusive (Geen & Thomas, 1986). The two most influential theories of media-related aggression have been proposed by Albert Bandura and Leonard Berkowitz. Bandura's (1973, 1983) social learning theory emphasizes the imitative and disinhibitive effects of media violence. According to social learning theory, people acquire aggressive responses either by direct experience or by observing others. Actors in the mass media, for example, may serve as aggressive models. More than half of major actors and about one third of all actors shown

on network television are involved in violent interactions (Gerbner, 1994). Viewers are most likely to imitate aggressive models in the mass media when violence is rewarded or goes unpunished. In a detailed content analysis of more than 5,000 hours of programming on cable and broadcast television, it was found that violence was explicitly rewarded 15% of the time and went unpunished 73% of the time (National Television Violence Study, 1996, 1997).

Habitual exposure to violent media may also reduce viewers' inhibitions against aggression. By the time the average child graduates from elementary school, he or she will have witnessed more than 8,000 murders and more than 100,000 other assorted acts of violence on broadcast television (Huston et al., 1992). The emergence of cable television and the videocassette allows even more frequent and extreme acts of aggression to be portrayed in the home. This barrage of violence may lead viewers to conclude that if others can behave aggressively without being caught and punished, then it is all right for them to behave aggressively too (Bandura, 1973).

Building on social learning theory, Huesmann (1986) proposed a social cognitive theory of media-related aggression. Huesmann suggested that when children observe violence in the mass media, they learn aggressive scripts for social behavior. The fundamental element in a script is the vignette, defined as an encoding of an event

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of short duration, consisting of both a perceptual image and a conceptual representation of the event (Abelson, 1976). For example, a simple vignette might consist of an image of one person hitting another in anger over something the other person has done. A script consists of a sequence of vignettes. Once a script has been stored in memory, it may be retrieved at some later time as a guide for behavior, such as in situations of interpersonal conflict that closely resemble conflicts seen in the media presentation. The person first selects a script to represent the situation and then assumes a role in the script.

In his early writings, Berkowitz (1962, 1974) interpreted media effects as conditioned responses to semantically associated stimuli. Several experiments conducted by Berkowitz and his colleagues yielded results consistent with this interpretation. In an early study by Geen and Berkowitz (1966), for example, male college students were first introduced to a confederate who was posing as a fellow participant, then were deliberately provoked by the confederate. The confederate was called "Bob Kelly," "Bob Dunne," or "Bob Riley." Next, participants watched a brief movie segment of a prizefight or an equally exciting but nonviolent track race. The loser of the prizefight was named Kelly, and the winner was named Dunne. After viewing the movie segment, participants were given the opportunity to evaluate the confederate's performance on a task by giving him electric shocks. Participants who saw the prizefight gave the confederate the greatest number of shocks, especially when the confederate had the same name as the loser of the prizefight. Participants presumably associated the confederate with the victim of the observed violence.

More recently, Berkowitz (1984, 1986, 1993) has rephrased his theory using cognitive terminology rather than association/conditioning terminology. Berkowitz (1984) has suggested that "the aggressive ideas suggested by a violent movie can prime other semantically related thoughts, heightening the chances that viewers will have other aggressive ideas in this period" (p. 411). Berkowitz bases this "priming" hypothesis on the cognitive psychology concept of spreading activation within a network in memory (e.g., Collins & Loftus, 1975): Thoughts send out radiating activation along associative pathways, thereby activating other related thoughts. In this way, ideas about aggression that are not identical to those observed in the media may be elicited by the latter. In addition, thoughts are linked, along the same sort of associative lines, not only to other thoughts but also to emotional reactions and behavioral tendencies (Bower, 1981; Lang, 1979). Thus, observation of violence can engender a complex of associations consisting of aggressive ideas, emotions related to violence, and the impetus for aggressive actions.

The pre-exposure strength of a mental construct relevant to the environmental input has been referred to as its *accessibility* (Bruner, 1957; Higgins & King, 1981; Wyer & Srull, 1981). The more accessible a construct, the more likely it is to be used to process and interpret social information (Bruner, 1957, 1958). Constructs can be chronically or temporarily accessible (e.g., Bargh, Lombardi, & Higgins, 1988; Sedikides & Skowronski, 1990). Repeated or frequent activation of a construct could result in a lowered threshold of activation, making a construct chronically accessible. An environmental input (e.g., a violent film) could result in a temporary lowered threshold of activation, making a construct accessible for a short time. This temporary increase in the accessibility of a construct is often called *priming*.

To date, only one published study has tested the temporary effects of violent media on the priming of cognitive-associative networks related to aggression (Bushman & Geen, 1990). In this study, men and women were randomly assigned to view either a nonviolent videotape or a tape with one of several predetermined levels of violence. Afterwards, participants listed the thoughts they had while viewing the videotape (Cacioppo & Petty, 1981). Participants were instructed to "record only those ideas that you were thinking about while watching the television segment," to express each idea as briefly as possible, and to not bother with grammar or spelling. Three minutes were allotted for the thought-listing procedure. The thoughts were classified as aggressive or nonaggressive by independent raters who were blind to videotape conditions and to experimental hypotheses. The results showed a positive relation between the amount of violence in the videotapes and the number of aggressive thoughts listed by participants. Bushman and Geen interpreted these results as evidence that the violent videotapes primed aggressive thoughts in viewers.

There are, however, alternative interpretations of the results reported by Bushman and Geen (1990). Their results could be due to demand characteristics (Orne, 1962): Participants who saw the violent videotapes may have listed aggressive thoughts because they thought that the experimenter wanted them to. Another interpretation of the results is that participants were merely recalling what they had seen in the videotapes. The two experiments reported in this article were designed to rule out these alternative explanations of the results reported by Bushman and Geen and, more important, to determine whether violent stimuli influence the accessibility of aggressive constructs in memory.

Cognitive psychologists have distinguished between direct (explicit) and indirect (implicit) measures of memory performance (e.g., Johnson & Hasher, 1987; Merikle & Reingold, 1991; Roediger, 1990; Schacter,

1987). Direct memory tasks (e.g., recall, recognition) require conscious expression of remembering, whereas indirect memory tasks (e.g., perceptual identification, word completion) do not. The memory task employed by Bushman and Geen (1990) was direct because it involved the recollection of conscious thoughts. Indirect tasks should not be as easily influenced by demand characteristics and other strategic factors as direct tasks. The two experiments reported in this article used indirect memory tasks to test the effects of violent media on the priming of cognitive-associative networks related to aggression.

#### EXPERIMENT 1

Carl Jung (1918) was probably the first psychologist to conduct word association studies. Jung used word associations as a method for probing the "unconscious mind." One of the major objections raised regarding Jung's methods was that it was difficult to treat individual word associations objectively because each association was subject to numerous interpretations (Secord, 1953). Researchers have attempted to overcome this objection by using homonyms as stimuli in word association studies. A homonym is defined as "one of two or more words spelled and pronounced alike but different in meaning" (*Merriam Webster's Collegiate Dictionary*, 10th ed., 1993). For example, Goodenough (1942) found that masculine and feminine interests could be distinguished on the basis of free associations to homonyms selected to have one meaning more feminine than the other (e.g., the homonym "bow" frequently elicited the response "arrow" from boys and the response "hair" from girls). In priming experiments, homonyms often are used as stimuli (e.g., Fleming, 1993; Grainger & Ferrand, 1994; Lesch & Pollatsek, 1993).

Some homonyms have one meaning more aggressive than the other. For example, the homonym "punch" might elicit either the aggressive association "hit" or the nonaggressive association "fruit"; the homonym "box" might elicit either the aggressive association "fight" or the nonaggressive association "cardboard"; and the homonym "sock" might elicit either the aggressive association "hit" or the nonaggressive association "foot." Which association is elicited by a homonym may depend, in part, on which concepts are accessible to the person at the time.

In Experiment 1, participants made free associations to homonyms, selected to have one meaning more aggressive than the other, and to nonaggressive control words. The free associations were recorded after participants viewed either a violent or a nonviolent videotape. If viewing violence primes cognitive-associative networks related to aggression, then aggressive constructs should be more highly activated and accessible for participants

who view a violent videotape than for participants who view a nonviolent videotape. Participants who viewed a violent videotape therefore were expected to list a greater number of aggressive associations to the homonyms than were participants who viewed a nonviolent videotape. Participants were not expected to list aggressive associations to the nonaggressive words, regardless of the videotape they viewed. Both men and women participated in the study to increase the generalizability of the results, but no specific sex differences were predicted.

#### Method

##### PARTICIPANTS

Participants were 200 undergraduate psychology students (100 men, 100 women), who spoke English as their first language. About 87% of the participants were White, which is higher than the national average of 83% (U.S. Bureau of the Census, 1996). Students voluntarily participated in exchange for extra course credit.

##### SELECTION OF HOMONYMS AND NONAGGRESSIVE WORDS

A separate group of 200 judges (100 men, 100 women), drawn from the same population as those who later would serve as participants in the experiment proper, rated the overall aggressiveness of 200 words. The list included words selected to have aggressive meanings (e.g., assault, attack, murder, pistol, torture), homonyms selected to have one meaning more aggressive than the other (e.g., cuff, mug, plaster, pound, sock), and control words selected to have nonaggressive meanings (e.g., button, feather, glide, relax, snail). For the homonyms, participants were not told which meaning to use. The words were listed in alphabetical order. Ratings were made along a 5-point Likert-type scale ranging from 1 (*not at all aggressive*) to 5 (*extremely aggressive*). From the list of 200 words, 26 homonyms and 26 nonaggressive words were selected for use in Experiment 1. Aggressiveness ratings were significantly higher for the homonyms ( $M = 2.7$ ,  $SE = 0.04$ ) than for the nonaggressive words ( $M = 1.3$ ,  $SE = 0.03$ ),  $t(199) = 35.04$ ,  $p < .05$ ,  $d = 2.46$ . There were no significant sex differences in aggressiveness ratings of homonyms and nonaggressive words,  $F_s(1, 198) = 2.32$ , and  $2.07$ , respectively,  $p_s > .05$ .

##### VIOLENT AND NONVIOLENT VIDEOTAPES

The videotapes were selected to be equally exciting but differentially violent. The following two videotapes were selected from a large pool of videotapes that were each about 15 minutes long (Bushman, 1995).

In *Karate Kid III*, the violent tape, a young man defeats an arrogant opponent in a karate tournament who repeatedly violates the rules by fighting "dirty." Prior to the tournament, the opponent had insulted the young man,

destroyed his property, and kicked his girlfriend in the stomach.

In *Gorillas in the Mist*, the nonviolent tape, a scientist observes gorillas in their natural habitat. At first, the gorillas seem threatened by the scientist. In time, however, the gorillas begin to trust the scientist, and they allow her to interact with them. Although this videotape was exciting and tense, it contained no violence.

Previous research (Bushman, 1995) has shown that these two videotapes do not differ in their effects on cardiovascular arousal (i.e., systolic blood pressure, diastolic blood pressure, mean arterial pressure, heart rate), and they do not differ on several rating dimensions (i.e., exciting, boring, arousing, emotionally moving, action packed, enjoyable, entertaining, frightening, humorous, sad). In previous experiments using these two videotapes (Bushman, 1995), higher levels of anger and aggressive behavior were found in participants who saw the *Karate Kid III* videotape than in participants who saw the *Gorillas in the Mist* videotape.

#### PROCEDURE

Individuals in the experiment proper participated in small groups, but they worked independently on the word association task. First, participants were given a cover sheet and consent form. The cover sheet stated that the purpose of the study was to test the effects of arousing stimuli on word association speed, and that exciting movie segments would be used to induce arousal. After informed consent was obtained, groups of participants were randomly assigned to view either the violent segment from *Karate Kid III* or the nonviolent segment from *Gorillas in the Mist*. Each videotape was shown to 100 participants (50 men, 50 women).

After viewing the videotape, participants completed the word association task. The procedure used for the word association task was similar to the one used by Goodenough (1942). To increase the likelihood of obtaining the strongest association for each stimulus word, the word association task was disguised as a speed test. The title on the response sheet was "SPEED-OF-ASSOCIATION TEST." The printed instructions on the response form were as follows:

This is a test to see how quickly you can think. In the space after each word, write the first word or phrase that this word makes you think of, no matter what it is. There are no right or wrong answers; this is just a test of speed. Work straight down the list as fast as you can. Give only one response for each word, and do not skip any words. Please write neatly because words that cannot be read will not count toward your score. Ask no questions after the test has begun.

The same randomized list of homonyms and nonaggressive control words was used for all participants. Using a large clock visible to all participants, the experimenter started all participants on the word association task at the same time. At the end of the task, participants recorded the time they finished the task, then calculated the number of seconds it took them to complete the task. The experimenter checked all calculations for accuracy. Finally, participants were questioned for suspicion, thoroughly debriefed, and thanked for their participation. No participant expressed suspicion about the purpose of the study.

#### Results

##### TIME TO COMPLETE THE WORD ASSOCIATION TASK

A 2 (videotape: violent, nonviolent)  $\times$  2 (participant sex) analysis of variance (ANOVA) was used to analyze the number of seconds it took participants to complete the word association task. No significant effects were found in this analysis. On average, it took participants 155 seconds to complete the word association task.

##### RELIABILITY OF WORD ASSOCIATION RATINGS

Two independent undergraduate student raters, blind to experimental conditions and to the hypotheses of the study, tabulated the number of aggressive associations participants made to the stimulus words. An aggressive association was defined operationally as any association having a hostile, injurious, or destructive connotation. A homonym was sometimes listed in response to a stimulus word. In such rare cases, raters were told to take into account the stimulus word when rating the association. For example, the association "slug" would be classified as aggressive in response to the stimulus word "punch," but it would be classified as nonaggressive in response to the stimulus word "snail." The intraclass correlation coefficient for the number of aggressive associations was .87 (Shrout & Fleiss, 1979). Because the intraclass correlation coefficient was high, the scores from the two raters were averaged.

##### AGGRESSIVE ASSOCIATIONS TO HOMONYMS AND NONAGGRESSIVE WORDS

A 2 (videotape: violent, nonviolent)  $\times$  2 (participant sex)  $\times$  2 (word type: homonyms, nonaggressive words) repeated measures analysis of variance was used to analyze the number of aggressive associations participants made to the stimulus words. The latter factor involved repeated measures.

The means and standard errors for the various conditions are displayed in Table 1. Significant main effects were obtained for videotape content, sex, and word type,  $F_s(1, 196) = 16.42, 8.69, \text{ and } 1122.15$ , respectively,  $p_s < .05$ . These main effects, however, were qualified by sig-

nificant interactions. As expected, there was a significant interaction between videotape content and word type,  $F(1, 196) = 13.26, p < .05$ . Participants who saw the violent video listed a greater number of aggressive associations to the homonyms than did participants who saw the nonviolent video,  $F(1, 196) = 15.10, p < .05, d = 0.54$ . Although aggressive associations to the nonaggressive words were rare, they were more common among participants who saw the violent video than among participants who saw the nonviolent video,  $F(1, 196) = 5.96, p < .05, d = 0.35$ .

There also was a significant interaction between sex and word type,  $F(1, 196) = 9.33, p < .05$ . Men listed a greater number of aggressive associations to the homonyms than did women,  $F(1, 196) = 9.15, p < .05, d = 0.41$ . There were no sex differences in aggressive associations to the nonaggressive words,  $F(1, 196) = 0.09, p > .05, d = 0.04$ . The Videotape  $\times$  Sex  $\times$  Stimulus Word Type interaction was nonsignificant.

### Discussion

Media violence was hypothesized to have a significant effect on aggressive associations to the homonyms. As expected, participants who saw the violent videotape listed a greater number of aggressive associations to the homonyms than did participants who saw the nonviolent videotape. Media violence also had a significant effect on aggressive associations to the nonaggressive words. Participants who saw the violent videotape listed a greater number of aggressive associations to the nonaggressive words than did participants who saw the nonviolent videotape. For example, some participants in the violent videotape condition listed associations such as "hit" and "kick" in response to the nonaggressive word "wall." Perhaps viewing a videotape about a karate match primed these aggressive constructs in memory. The results from Experiment 1 are entirely consistent with Berkowitz's (1984) idea that viewing violence primes aggressive cognitive-associative networks in viewers.

When participants were given a task that tapped their interpretation of the homonyms, men gave more aggressive interpretations than did women, regardless of the videotape they watched. This finding is consistent with the common view that men in our society are more exposed to and familiar with aggressive ideas and situations than are women. One post hoc explanation for this sex difference is that aggressive concepts are more chronically accessible for men than for women.

There are at least three reasons to believe that demand characteristics did not significantly influence the results obtained in Experiment 1. First, the word association task was disguised as a speed test. Thus, participants should have focused more on the speed of associations than on the content of associations. Second, videotape

**TABLE 1: Effects of Videotape Content on the Number of Aggressive Associations Listed for the Homonyms and Nonaggressive Words**

Sex	Violent Videotape		Nonviolent Videotape	
	M	SE	M	SE
Homonyms				
Male	7.7	0.46	6.2	0.35
Female	6.5	0.42	5.1	0.28
Nonaggressive Words				
Male	0.2	0.08	0.0	0.02
Female	0.1	0.06	0.0	0.03

NOTE:  $n = 100$  (50 men, 50 women) for each videotape condition. The homonyms were selected to have one meaning more aggressive than the other.

content did not influence time to complete the word association task. Participants in the violent videotape condition did not spend more time thinking about what associations the experimenter wanted to the stimulus words than did participants in the nonviolent videotape condition. Third, no participant expressed suspicion about the experiment.

Experiment 1 showed that a violent videotape affected the content of the participant's responses. Although unlikely, it could be argued that participants who saw the violent videotape correctly guessed the true purpose of the experiment and intentionally listed aggressive associations to the ambiguous homonyms rather than the first associations that came to mind. Experiment 2 was conducted to rule out this possibility and to examine whether viewing violence affects the speed with which aggressive information is processed. Experiment 2 used a lexical-decision task rather than a word association task. On the word association task, there is no clear correct response to each stimulus. The major strength of the lexical-decision task is that it is relatively immune to general strategic factors, such as demand characteristics, because there is a clear correct response to each stimulus. Experiment 2 also provided a conceptual replication of Experiment 1 using a different indirect memory task.

### EXPERIMENT 2

In Experiment 2, participants completed a lexical decision task after viewing either a violent or nonviolent videotape. In the lexical decision task, participants were shown letter strings on a computer screen and were told to press one computer key if they thought the letter string was an English word, or to press another key if they thought the letter string was a nonword. Half of the words were selected to have aggressive meanings and half were selected to have nonaggressive meanings.

If viewing violence primes cognitive-associative networks related to aggression, then aggressive words

should be more highly activated and accessible for individuals who view a violent videotape than for individuals who view a nonviolent videotape. Within the word recognition literature, reaction time frequently is used to measure the accessibility of a construct: The faster the reaction time, the more accessible the construct (Morton, 1970). A significant interaction between videotape content and letter string type was therefore predicted. Participants in the violent videotape condition were expected to have faster reaction times to the aggressive words than were participants in the nonviolent videotape condition. Videotape content was not expected to influence reaction times to the nonaggressive words. Error rates also were analyzed to determine whether there was a speed-accuracy trade-off on the lexical-decision task.

### Method

#### PARTICIPANTS

Participants were 300 undergraduate psychology students (150 men, 150 women) who spoke English as their first language. About 87% of the participants were White. Students received extra course credit in exchange for their voluntary participation.

#### SELECTION OF AGGRESSIVE WORDS, NONAGGRESSIVE WORDS, AND NONWORDS

The 24 aggressive and 24 nonaggressive words used in Experiment 2 were the same words used in an experiment conducted by Anderson and his colleagues (Anderson, Anderson, & Deuser, 1996). The aggressive and nonaggressive words were equated for length and were deemed above an acceptable level of familiarity by the Thorndike-Lorge Inventory (Thorndike & Lorge, 1944) of familiarity of words in the English language ( $M_s = 40.6$  and  $45.3$ ,  $SD_s = 28.5$  and  $34.0$ , for the aggressive and nonaggressive words, respectively). The 48 words used by Anderson et al. were included in the list of 200 stimulus words that were rated for Experiment 1. Results showed that aggressiveness ratings were significantly higher for the aggressive words ( $M = 3.9$ ,  $SE = 0.04$ ) than for the nonaggressive words ( $M = 1.6$ ,  $SE = 0.04$ ),  $t(199) = 48.31$ ,  $p < .05$ ,  $d = 3.42$ . Aggressiveness ratings of aggressive words were significantly higher for women ( $M = 4.0$ ,  $SE = 0.06$ ) than for men ( $M = 3.8$ ,  $SE = 0.07$ ),  $t(198) = 2.11$ ,  $p < .05$ ,  $d = 0.29$ . There were no sex differences in aggressiveness ratings of nonaggressive words,  $t(198) = 1.08$ ,  $p > .05$ .

A set of 48 nonwords was created for use in Experiment 2. The nonwords were constructed to be readily pronounceable by native English speakers. The nonwords were created such that the same number of nonwords started with vowels and consonants as did the English words. The nonwords and English words also

were matched according to the number of syllables they contained.

#### PROCEDURE

Individuals in the experiment proper participated alone in a small room. First, the participant was given a cover sheet and a consent form. The cover sheet stated that the purpose of the study was to test the effects of arousing stimuli on reaction times. The participant was told that exciting movie segments would be used to induce arousal, and that reaction time would be measured using a lexical-decision task.

The experimenter then explained the lexical-decision task to the participant. To initiate each trial, the participant pressed a mouse button with his or her nondominant hand. After pressing the mouse button, the following sequence appeared on the computer screen: a fixation cue displayed for 490 msec, a letter string displayed for 154 msec, and a pattern mask (a dense arrangement of straight and curved lines) displayed for 490 msec. The participant's task was to press one key on the computer keyboard if he or she thought the letter string was an English word, or to press another key if he or she thought the letter string was a nonword. The participant pressed the computer keys with his or her dominant hand. The participant was instructed to respond as quickly as possible while being careful to get at least 90% of the trials correct. After each trial, the participant was given feedback about his or her accuracy for that trial and, if the correct response was given, the participant was given feedback about his or her reaction time. Following the explanation of the lexical decision task, the participant completed 20 practice trials (10 words and 10 nonwords) while the experimenter looked on.

All letter strings were written in lower case, 60 point, Palatino bold font. The participant was seated 54 cm away from the presentation monitor. When displayed on the computer monitor, the letter strings subtended a vertical visual angle of 1.6 degrees and a maximum horizontal visual angle of 9.5 degrees. Stimuli were displayed on an Apple 13-inch monitor with a resolution of 640 horizontal pixels by 480 vertical lines. Stimulus presentation, participant responses, timing, and data recording were all performed on a Macintosh Powerbook 180 computer using Picture Perception Lab software (Kohlmeier, 1992).

After the participant completed the practice trials, the experimenter left the room. Next, the participant was randomly assigned to watch either the violent video segment from *Karate Kid III* or the nonviolent video segment from *Gorillas in the Mist* (i.e., the same videotapes used in Experiment 1). Each videotape was shown to 150 participants (75 men and 75 women). After view-

ing the videotape, the participant completed the lexical decision task. The same random sequence of words and nonwords was used for all participants in the experiment. The participant saw a total of 96 trials during the experiment (48 words, 48 nonwords). Finally, the participant was questioned for suspicion, thoroughly debriefed, and thanked for his or her participation. No participant expressed suspicion about the purpose of the study.

## Results

### REACTION TIMES

The reaction times for correct responses were analyzed using a 2 (videotape: violent, nonviolent)  $\times$  2 (participant sex)  $\times$  2 (word type: aggressive, nonaggressive) repeated measures analysis of variance. The latter factor involved repeated measures.

Table 2 lists the reaction time means and standard errors for the various experimental conditions. As expected, there was a significant interaction between videotape content and word type,  $F(1, 296) = 7.98, p < .05$ . Participants who saw the violent video had faster reaction times to the aggressive words than did participants who saw the nonviolent video,  $F(1, 296) = 6.52, p < .05, d = 0.30$ . Videotape content did not significantly influence reaction times to the nonaggressive words,  $F(1, 296) = 1.27, p > .05, d = 0.13$ .

Other significant effects, less central to the hypotheses being tested, also were found. There was a main effect for word type,  $F(1, 296) = 8.33, p < .05$ . Reaction times were faster for nonaggressive words than for aggressive words. There also was a main effect for sex,  $F(1, 296) = 4.57, p < .05$ . Overall, reaction times were faster for men than for women. The Videotape  $\times$  Sex and the Videotape  $\times$  Sex  $\times$  Word Type interactions were nonsignificant.

### ERRORS

The proportion of errors participants made in response to aggressive words was analyzed to determine if there was evidence for a speed-accuracy trade-off. The error rates were analyzed using a 2 (videotape: violent, nonviolent)  $\times$  2 (participant sex)  $\times$  2 (word type: aggressive, nonaggressive) repeated measures analysis of variance. The latter factor involved repeated measures.

Table 3 lists the error rate means and standard errors for the various conditions. The analysis found no significant effects involving videotape content. The Videotape, Videotape  $\times$  Sex, Videotape  $\times$  Word Type, and Videotape  $\times$  Sex  $\times$  Word Type effects all were nonsignificant. Thus, the effect of videotape content on reaction times to aggressive words is not likely due to a speed-accuracy trade-off.

**TABLE 2: Effects of Videotape Content on Reaction Times for Correct Responses to Aggressive and Nonaggressive Words**

Sex	Violent Videotape		Nonviolent Videotape	
	M	SE	M	SE
Aggressive Words				
Male	547	8.8	573	6.9
Female	574	6.9	587	8.0
Nonaggressive Words				
Male	549	9.5	568	7.6
Female	571	7.0	570	8.1

NOTE: Reaction times are recorded in milliseconds.  $n = 150$  (75 men, 75 women) for each videotape condition.

**TABLE 3: Effects of Videotape Content on Percentage of Errors on the Aggressive and Nonaggressive Words**

Sex	Violent Videotape		Nonviolent Videotape	
	M	SE	M	SE
Aggressive Words				
Males	11.4	1.08	11.9	1.13
Females	10.2	0.83	10.5	0.93
Nonaggressive Words				
Males	12.8	0.93	15.0	1.09
Females	10.7	0.87	12.0	0.95

NOTE:  $n = 150$  (75 men, 75 women) for each videotape condition.

There was a significant main effect for word type,  $F(1, 296) = 10.98, p < .05$ . Participants made fewer errors for the aggressive words than for the nonaggressive words. Reaction times were slower, however, for aggressive words than for nonaggressive words. There also was a significant main effect for sex,  $F(1, 296) = 5.03, p < .05$ . Overall, women made fewer errors than did men; however, reaction times were slower for women than for men. The Sex  $\times$  Word Type interaction was nonsignificant.

## Discussion

Videotape content was expected to have a significant effect on reaction times to the aggressive words but not on reaction times to the nonaggressive words. The results were consistent with these predictions. Participants who saw the violent videotape had faster reaction times to the aggressive words than did participants who saw the nonviolent videotape. Videotape content did not significantly influence reaction times to the nonaggressive words. Moreover, the effects of videotape content on reaction time to the aggressive words cannot be explained in terms of a speed-accuracy trade-off. The results from Experiment 2 are consistent with Berkowitz's (1984) idea that viewing violence primes aggressive cognitive-associative networks. Furthermore, it is highly



unlikely that the results from Experiment 2 are due to general strategic factors such as demand characteristics.

#### GENERAL DISCUSSION

The findings from the present research show that violent media increase the accessibility of aggressive constructs in viewers. Anderson (1997) has recently replicated the present findings using a word pronunciation task to measure the accessibility of aggressive constructs. The more accessible a construct, the more likely it is to be used to process and interpret social information (Bruner, 1957, 1958). For example, several studies have shown that priming by aggressive stimuli can influence individuals to make hostile attributions about the behavior of other people (e.g., Bargh & Pietromonaco, 1982; Carver, Ganellen, Froming, & Chambers, 1983, Experiment 1; Wann & Branscombe, 1990; Zelli, Huesmann, & Cervone, 1995). Consider the following hypothetical scenario. Suppose that a man is shoved from behind as he is leaving a movie theater. The man could interpret this ambiguous action as either intentional or accidental. How the event is interpreted may depend, in part, on which constructs are accessible to the man at the time. If the man has just seen a violent movie, then he might be more likely to interpret the shove as a hostile action than if he has just seen a nonviolent movie. The man might be expected to behave more aggressively if he interprets the shove as intentional than if he interprets it as accidental. In other words, he may attribute the ambiguous shove to hostile intentions, and therefore respond with aggression (e.g., Betancourt & Blair, 1992; Dodge & Crick, 1990; Ferguson & Rule, 1983; Weiner, 1995).

Chronically accessible constructs, such as hostile attributional biases, also have been shown to influence the interpretations people make about the behavior of others (e.g., Dodge, Price, Bachorowski, J., & Newman, 1990; Graham & Hudley, 1994). Activation of such hostile attribution biases, in turn, increases the probability of aggressive actions. Although such biases may have their origins in a variety of early experiences, repeated exposure to violent media may well play an important role in the development of their chronic accessibility. In other words, although the immediate priming effects of media violence are short-lived, the consequences of such priming could be long-lasting. By actively rehearsing scenes of violence portrayed in the mass media, the primed aggressive concepts may remain active in memory and may eventually raise the threshold of activation so that aggressive constructs become chronically more accessible.

There is a large body of literature on the importance of cognitive processes for action. Several studies have shown that priming by aggressive stimuli can increase

aggressive behavior (e.g., Berkowitz & Le Page, 1967; Carver et al., 1983, Experiment 2; Leyens & Dunand, 1991). In one study (Carver et al., 1983, Experiment 2), for example, male undergraduate students first completed a priming task in which they selected three words from a list of four scrambled words to form a sentence. In the hostile priming condition, 80% of the lists contained aggressive words (e.g., "hits he her them"). In the neutral priming condition, only 20% of the lists contained aggressive words. Then, in what they believed to be an unrelated second study, participants were told to give shocks to another "participant" (actually a confederate) whenever he made an incorrect response on a learning task. The results showed that participants in the hostile priming condition gave more intense shocks to the confederate than did participants in the neutral priming condition.

In summary, although the link between media violence and aggressive behavior has been well established, theoretical explanations for media-related aggression have tended to be limited and inconclusive (Geen & Thomas, 1986). It is now time to move beyond asking the question of whether media violence increases aggression to asking the question of why media violence increases aggression (American Psychological Association, 1993). The results reported in this article provide one possible explanation for media-related aggression: Scenes of violence in the mass media prime aggressive constructs in memory, making them more accessible to viewers.

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