Research Article

REPEATED EXPOSURE TO SUGGESTION AND THE CREATION OF FALSE MEMORIES

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Abstract—*The purpose of the present study was to extend research on repetition and illusory truth to the domain of eyewitness suggestibility. Specifically, we assessed whether repeated exposure to suggestion, relative to a single exposure, facilitates the creation of false memory for suggested events. After viewing a video of a burglary, subjects were asked questions containing misleading suggestions, some of which were repeated. Their memory for the source of the suggestions was tested. The results show that following repeated (relative to a single) exposure to suggestion, subjects were more likely to (a) claim with high confidence that they remembered the suggested events from the video (Experiment 1) and (b) claim that they consciously recollected witnessing the suggested events (Experiment 2). The effects of repeated exposure were highly reliable and were observed over retention intervals as long as 1 week.*

Repetition produces the illusion of truth. Studies have shown that subjects rate repeated statements as more true than statements that have not been repeated (e.g., Arkes, Hackett, & Boehm, 1989; Bacon, 1979; Begg, Anas, & Farinacci, 1992; Begg & Armour, 1991; Hasher, Goldstein, & Toppino, 1977; Schwartz, 1982). More important, this increased belief in repeated statements occurs regardless of the actual truth of the statements. The purpose of the present study was to extend research on repetition and illusory truth to the domain of eyewitness suggestibility. It seems reasonable to extrapolate from the literature on illusory truth effects and assume that repetition of a postevent suggestion will increase subjects' belief that the suggested events transpired, and hence prove harmful. What is unclear is whether repetition might also promote the creation of false memories for suggested events.

Understanding the memorial consequences of repeated exposure to suggestion has considerable practical, as well as theoretical, implications. For example, repeated exposure to misinformation is not uncommon in eyewitness interrogation procedures. Knowing what effects repeated misinformation might have on eyewitness memory is therefore critical. Also, given the current controversy surrounding allegedly false memories induced by therapy (e.g., Lindsay & Read, 1994; Loftus & Ketcham, 1994), the need for scientific evidence on the relationship between repeated suggestion and false memory seems especially acute. One of the reasons that the therapeutic process is thought to be potentially conducive to the formation of false memories is the fact that suggestions encountered in the course of therapy are likely to be repeated over time. In other words, it is often assumed that repeated suggestion might be an especially potent means of inducing false memories.

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In actuality, however, there is very little scientific evidence to support this assumption. Although there is a substantial literature on the suggestibility of eyewitness memory, the effects of repetition, per se, have received almost no systematic attention. In the few studies that have employed repeated suggestion, the data have not provided clear support for a link between repetition and false memory. For example, Ceci, Loftus, Leichtman, and Bruck (1994) had children recount a fictitious event (e.g., that they got their finger caught in a mousetrap) on a weekly basis for 10 weeks and showed that children's tendency to assent to remembering the suggested events increased steadily over this period. An interpretive difficulty with this and similar studies (e.g., Loftus & Ketcham, 1994) is that number of repetitions is correlated with the passage of time since the initial suggestion. For this reason, it is impossible to disentangle the effects of repetition from the effects of time. Interestingly, the one study that does permit clear conclusions about the effects of repeated suggestion found no deleterious effects of repetition (Warren & Lane, 1995).

Although the empirical literature on eyewitness suggestibility has yet to establish a clear association between repetition and false memories, there is quite good evidence that even single exposures to suggestion can induce false memory (Ackil & Zaragoza, 1995; Belli, Lindsay, Gales, & McCarthy, 1994; Lindsay, 1990; Zaragoza & Lane, 1994). Several studies have shown that subjects who are exposed to misleading suggestions about an event they have witnessed later claim to remember witnessing the suggested events, an error that we view as a *source misattribution* (e.g., Zaragoza & Lane, 1994).

Given current theoretical understanding of source misattribution errors, what can one predict about the effect of repeated suggestion on the incidence of such errors? On the one hand, it is reasonable to expect that, in addition to improving memory for the suggestion itself, repeated exposure is likely to improve subjects' memory for the fact that the suggestion came from a postevent source. On this basis, repeated exposure to suggestion should reduce source misattribution errors, because all other things being equal, the better one's memory for an item's actual source, the less likely one should be to misattribute its source (see Johnson, Hashtroudi, & Lindsay, 1993, for a review).

On the other hand, when subjects attempt to answer misleading questions about witnessed events, they are likely to think about and imagine the events (both accurate and suggested) described in the questions. Accordingly, subjects' memory for the postevent episode will preserve information from these reflective processes along with information about the objective experience of having read or heard the questions. Therefore, a possible consequence of repeated exposure to suggestion is that the image the subject creates of the suggested event will become increasingly elaborate, detailed, and seemingly

real. As a result, misattribution errors should increase because the memory record of these imagined events will have become more similar to, and hence more confusable with, that of the actually witnessed event.

The present experiments assessed whether repeated exposure to suggestion facilitates the creation of a false memory for suggested events. Subjects viewed a videotape depicting a burglary and later answered questions about the event. Some of these questions contained misleading suggestions (e.g., that the thief had a gun when in fact he did not have a weapon). For each subject, some suggestions appeared once and others three times. Finally, subjects were tested on their memory for the source of suggested items. False memory was measured as the tendency for subjects to incorrectly claim they remembered seeing suggested items in the video. The question of primary interest was whether repeated exposure to misinformation would increase the incidence of such errors.

EXPERIMENT 1

Method

Two hundred fifty-five undergraduates participated in partial fulfillment of a course requirement. Of these subjects, 135 were in the immediate group (distributed equally in the early-, middle-, and late-placement conditions, described later). The 48-hr and 1-week delay groups each had 60 subjects. The immediate and delay groups were run as separate experiments, but they are reported together for ease of exposition.

The eyewitness event

Subjects viewed 5 min of a police training film depicting a home burglary by two youths and a car chase by police.

Postevent questioning

Immediately after viewing the video, subjects completed a postevent questionnaire. For each subject, some of the questions were misleading in that they presupposed the existence of objects or events that, although plausible, were not in the video (e.g., that the thief wore gloves). Across the experiment, 12 misleading suggestions were used (see Table 1), each corresponding to a distinct scene from the video. For each subject, four suggestions were assigned to each of three exposure levels: zero, one, or three. Across subjects, all suggestions served equally often in each exposure condition.

Table 1. *Misleading suggestions*

thief wore gloves
thief pulled down a window shade
thief stole a ring
driver smoked a cigarette
neighbor's name was Mrs. Anderson
there was a barking dog
thief had a gun
thief put his seatbelt on
police officer had a Coke
police officer said driver was DWI
car jumped a curb
police said they'd shoot

The 36-item questionnaire consisted of three subsets of 12 questions, with each question corresponding to 1 of the 12 scenes from the video. To implement the repeated-exposure manipulation in a natural way, we questioned subjects about the 12 scenes in chronological order three times successively, each time about slightly different aspects of the same scenes. For each subject, suggestions assigned to the three-exposure condition were embedded in each of the three questions about the relevant scene, as shown in the following example (suggestion: "the thief wore gloves"):

1. At the beginning of the scene, a young man dressed in jeans, a t-shirt and gloves entered the house. Did he enter through the door?
13. Let's begin at the start of the scene again. At the beginning of the film clip, the young man who entered the house was dressed in jeans, a t-shirt and gloves. Was it a "Mickey Mouse" t-shirt?
25. OK, returning once again to the beginning of the scene, a slender young man wearing jeans, a t-shirt and gloves entered the house. Did he wear a jacket?

For other exposure conditions, suggestions (e.g., "and gloves") were simply deleted as necessary from either all (zero exposure) or two (one exposure) of the three questions, and the rest of each question remained identical.

For the immediate group, each one-exposure suggestion appeared in either the first (early condition), second (middle condition), or third (late condition) of the three questions about the relevant scene. Because placement of the suggestion had no effect (discussed later), for the delay groups, the one-exposure items always appeared in the third subset of questions to minimize forgetting of these items over the retention interval.

Across subjects, the questionnaire varied only with regard to the assignment of suggested items to exposure condition. Additionally, some actually perceived objects and events were mentioned in the questionnaire once and others three times, so that number of repetitions was not correlated with the accuracy of the information.

Source memory test

After a delay of either 10 min (immediate), 48 hr, or 1 week, subjects received a source memory test. Subjects were told that they would hear a list of 32 recorded statements and that their task was to answer two questions about each: whether they remembered the item from the video and whether they remembered the item from the questions. Subjects indicated their confidence in their responses to both questions on an answer sheet that contained two columns, labeled "Video?" and "Questions?" Each column contained Likert-type scales with the response options "definitely yes," "probably yes," "maybe yes," "unsure," "maybe no," "probably no," and "definitely no." Note that the availability of "unsure" as a response option should have minimized the contribution of guessing to performance.

The test probes consisted of the 12 suggestions (4 each at zero, one, and three exposures) intermixed with 20 filler items from other sources (video only, both video and questionnaire,

new) so that there was an equal number of test items from each of the four possible source categories (video only, questionnaire only, both, or new). The filler items were chosen to be very obvious members of their source categories so as to provide a conservative benchmark against which subjects could evaluate their memory for the suggestions. Subjects were accurately informed that some of the questions they had answered contained information that was not in the videotape and that the test list contained items from each of the four possible source categories, thus minimizing the possibility that subjects would claim to remember witnessing the suggested events merely because they trusted that the questionnaire was completely accurate.

This study was designed to assess whether subjects' memory for the source of suggested items varied as a function of exposure, and for this reason we present the results for the suggestions only. A "yes" response to a suggestion in response to the "Video?" probe indicated a source misattribution error (i.e., false memory), and a "yes" response to a suggestion in response to the "Questions?" probe indicated a correct source judgement. Note that these were not mutually exclusive judgments; it was possible for subjects to respond "yes" to both questions, thereby simultaneously making an error and a correct response.

Results and Discussion

For all analyses, reliability was at the $p < .01$ level unless noted. For the immediate group, the data are collapsed across placement condition because placement had no effect on performance (see Table 2; all $Fs \leq 1$, $ps > .10$).

Figure 1 shows the mean proportion of total "yes" responses (i.e., the sum of "definitely yes," "probably yes," and "maybe yes") to each of the two source probes as a function of exposure condition (zero, one, three) for each of the three groups. In all three groups, affirmative responses to both "Questions?" and "Video?" increased as a function of exposure: for "Questions?" $F(2, 264) = 970.63$, $F(2, 118) = 133.02$, and $F(2, 118) = 115.42$ for the immediate, 48-hr, and 1-week groups, respectively; for "Video?" $F(2, 264) = 110.04$, $F(2, 118) = 59.66$, and $F(2, 118) = 60.48$ for the immediate, 48-hr, and 1-week groups, respectively. More important, post hoc analyses confirmed that for both source probes in every group, the proportion of affirmative responses was greater for three exposures than for one exposure, and greater for one exposure than for zero exposures. If we consider first the one- versus zero-exposure contrast, inspection of Figure 1 reveals that subjects rarely claimed to remember the nonsuggested items (zero exposures) from either source, though false alarms were greater for the "Video?" than the "Questions?" probe. Whereas the zero- to one-exposure increase in "yes" responses to "Questions?" is not very informative, the zero- to one-exposure increase in "yes" responses to "Video?" is much more so because it demonstrates that even single exposures to suggestion induced false memories. Finally, the consistent advantage of the three-exposure items over one-exposure items for both test probes supports the prediction that, in all groups, repeated exposure to suggestion would both improve subjects' ability to accurately identify the questions as the suggested items' source and increase false memory for having witnessed the suggested events in the video. Note that the questions contained a great deal of information that overlapped with the content of the video. Consequently, knowledge that an item appeared in the questions did not provide a very informative basis for discriminating between actually witnessed and suggested items.

What cannot be discerned from Figure 1 is the extent to which repeated exposure to suggestion might have induced subjects to misattribute the suggestions to the video only. The relevant data are presented in Table 3, which depicts how subjects distributed their responses to the two source probes (i.e., the proportion of times subjects selected "yes" to both probes, "yes" to "Questions?" only, "yes" to "Video?" only, and "no" to both) as a function of exposure condition (one vs. three) and group. Inspection of Table 3 reveals clearly that repeated suggestion never led to an increase in the number of video-only "yes" responses; the effect resided entirely in an increase in "yes" responses to both "Video?" and "Questions?"

Table 3 reveals that repeated exposure had another effect on subjects' responding. At all three retention intervals, repeated exposure dramatically reduced forgetting of the suggestions, as evidenced by the significant decline in neither-video-nor-questions responses among the three-exposure items, $F(1, 132) = 46.60$, $F(1, 59) = 14.11$, and $F(1, 59) = 37.66$ for the immediate, 48-hr, and 1-week groups, respectively. This finding raises the possibility that the effects of repeated exposure are simply an artifact of differences in old/new recognition. Because subjects cannot make a source judgment about an item they completely fail to remember, the finding that subjects made fewer correct and incorrect source attributions to the one-exposure items than to the three-exposure items may simply reflect fewer opportunities to make source judgments. Hence, to better assess the effects of repeated suggestion on source

Table 2. *Subjects' attributions of source ("yes" responses for "Questions?" and "Video?") for suggested items as a function of placement condition and repetition: Immediate group*

	"Questions?"			"Video?"		
Placement condition	Zero exposures	One exposure	Three exposures	Zero exposures	One exposure	Three exposures
Early	.01	.70	.89	.08	.36	.52
Middle	.01	.67	.88	.13	.37	.61
Late	.02	.78	.89	.08	.38	.56

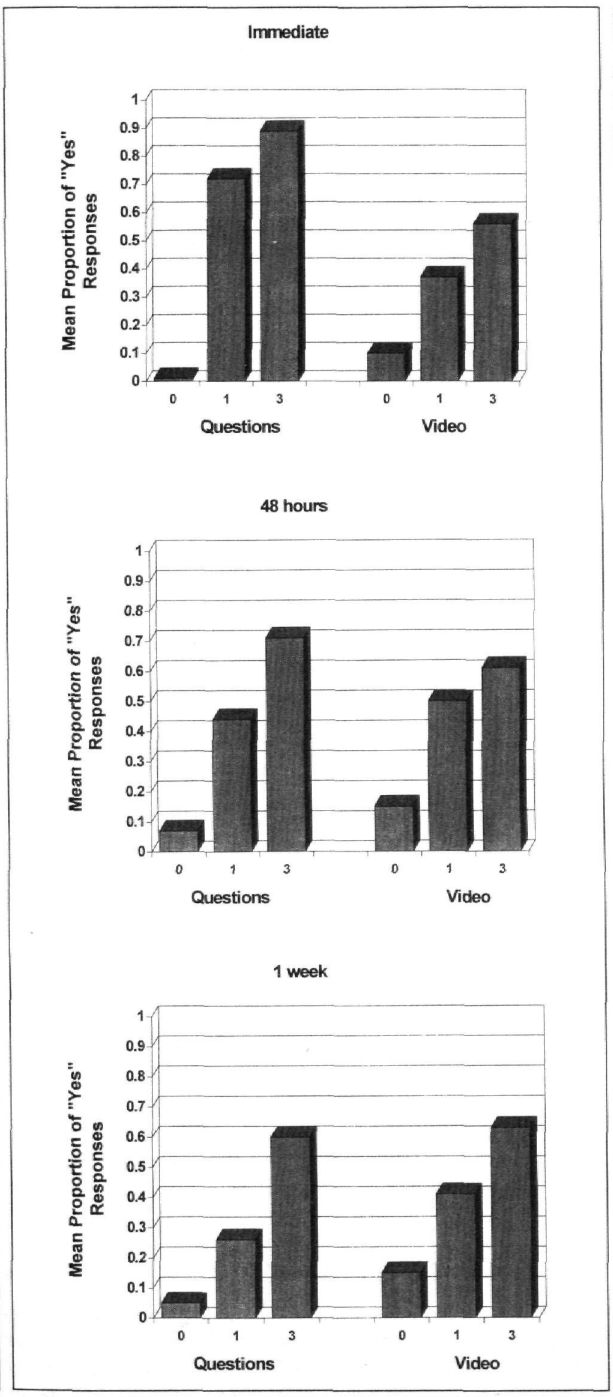

Fig. 1. Subjects' attributions of source ("yes" responses for "Questions?" and "Video?") for suggested items as a function of number of exposures (zero, one, or three) and retention interval. Data are collapsed across confidence levels ("definitely yes" + "probably yes" + "maybe yes").

memory, we examined subjects' source judgments conditionalized on old/new recognition (see Fig. 2). That is, we controlled for differences in recognition by restricting the analyses to recognized suggestions (those identified as being from one or more of the experimental sources: video, questions, or both) and report, by confidence level, the proportion of these that were attributed to each source.

Figure 2 shows that conditionalizing the data does not alter the main findings. In the immediate group, repeated exposure to suggestion improved subjects' memory for the true source of the suggestions and increased false memory for suggested events, and it did so whether one considers all "yes" responses ("Questions?": $F[1, 132] = 9.89$; "Video?": $F[1, 132] = 22.22$) or restricts the analyses to affirmative responses made with highest confidence (i.e., "definitely yes") ("Questions?": $F[1, 132] = 12.98$; "Video?": $F[1, 132] = 57.99$). In the delay groups, the pattern is the same, with one exception. When total "yes" responses are considered, repeated exposure did not lead to a significant increase in misattributions to the video, $Fs(1, 59) = 0.004$ and 1.07 for the 48-hr and 1-week groups, respectively, $ps > .30$. In contrast, repeated exposure did lead to a highly significant increase in "definitely yes" errors in both delay groups, $Fs(1, 59) = 6.31$ and 8.38 for the 48-hr and 1-week groups, respectively. The apparent discrepancy between these two measures results because the lower rate of high-confidence errors to the one-exposure items is offset by a higher rate of low-confidence errors. This higher incidence of low-confidence errors to the one-exposure relative to three-exposure items is not surprising given the pronounced decrement in subjects' ability to remember the actual source of the one-exposure items in the delay groups (see Fig. 2). It is well established that subjects are likely to misattribute items whose origin they cannot remember. Hence, what is striking about the present results is that repetition produced a marked increase in high-confidence misattribution errors even though it also served to preserve subjects' memory for the source of the suggestions.

EXPERIMENT 2

We have argued that the foregoing results provide evidence that repeated exposure to suggestion increases false memory for having witnessed suggested events. There is, however, an alternative explanation that is difficult to rule out. It is possible that subjects failed to distinguish between events they believed happened in the video and events they specifically remembered witnessing in the video, and that the previous results simply reflect an increased belief in the suggested events, rather than increases in false memory per se. To assess this possibility, we explicitly directed subjects in Experiment 2 to make the distinction between information they believed to have been in the video and that which they specifically remembered witnessing in the video.

Method

With the exception of the instructions and response options of the source memory test, the 57 subjects who participated in Experiment 2 went through a procedure identical to that of the immediate group in Experiment 1 (late-placement condition).

Table 3. *Joint probability of "yes" and "no" responses to "Questions?" and "Video?" for suggested items as a function of repetition and retention interval*

A. Immediate group

One exposure			Three exposures		
	Video			Video	
Questions	Yes	No	Questions	Yes	No
Yes	.30	.42	Yes	.53	.36
No	.07	.21	No	.03	.08

B. 48-hr group

One exposure			Three exposures		
	Video			Video	
Questions	Yes	No	Questions	Yes	No
Yes	.24	.20	Yes	.50	.21
No	.24	.32	No	.11	.18

C. 1-week group

One exposure			Three exposures		
	Video			Video	
Questions	Yes	No	Questions	Yes	No
Yes	.18	.11	Yes	.47	.13
No	.26	.45	No	.17	.23

Subjects were asked to answer two questions for each test statement: whether they remembered it (a) from the video and (b) from the postevent questions. For each of these questions, there were three response options: "remember," "believe," or "neither." The instructions told subjects to select "remember" only if they could consciously recollect that the test item came from that source. Subjects were told to select "believe" if they were not able to consciously recollect the original experience but nevertheless believed that the test item was from that source. The instructions emphasized that "remember" and "believe" did not correspond to high and low confidence, and subjects were given examples of situations in which one might have high confidence in a belief that something happened, despite the absence of conscious recollection. We expected that if repeated exposure to suggestion increases false memory, subjects would be more likely to claim they "remembered" the suggested items from the video following three exposures to suggestion than following one exposure.

Results and Discussion

To assess the effects of repeated suggestion, we report "remember" responses conditionalized on recognition for the one- and three-exposure items. The pattern of "remember" responses closely matches the results of Experiment 1: Repeated exposure both improved memory for actual source (Ms = .75 and .88 for one and three exposures, respectively; $F[1, 56] = 12.1$) and led to an increase in false memory for suggested events (Ms = .15 and .28 for one and three exposures, respectively; $F[1, 56] = 11.3$). This latter finding converges with those of Roediger and McDermott (1995), who found that subjects claimed to specifically remember having studied words that had not been presented but were conceptually related to the studied list.

In contrast, there was no evidence that repeated exposure increased belief without conscious recollection. Repeated exposure did not increase the proportion of times subjects incorrectly claimed they merely "believed" the suggested items were in the video (Ms = .40 for both one and three exposures, $p > .8$). Similarly, the proportion of "believe" responses to the "Questions?" probe did not vary as a function of repetition (Ms = .17 and .11 for one and three exposures, respectively, $p > .1$).

In sum, the results of Experiment 2 show that repeated exposure did not merely lead to an increase in the phenomenal experience of nonspecific familiarity (cf. Mandler, Nakamura, & Van Zandt, 1987). Rather, our results show that repetition increased the prevalence of discrete memories of having experienced the suggestions in both the video subjects saw and the questions they answered.

GENERAL DISCUSSION

Taken together, the results of these experiments provide strong evidence that repeated exposure to suggestion facilitates the creation of false memory. Following repeated exposure to suggestion, relative to single exposures, subjects were more likely to (a) claim with high confidence that they remembered the suggested events from the video (Experiment 1) and (b) claim that they consciously recollected witnessing the suggested events (Experiment 2). Hence, with repeated exposure, subjects were not just more likely to claim they believed that

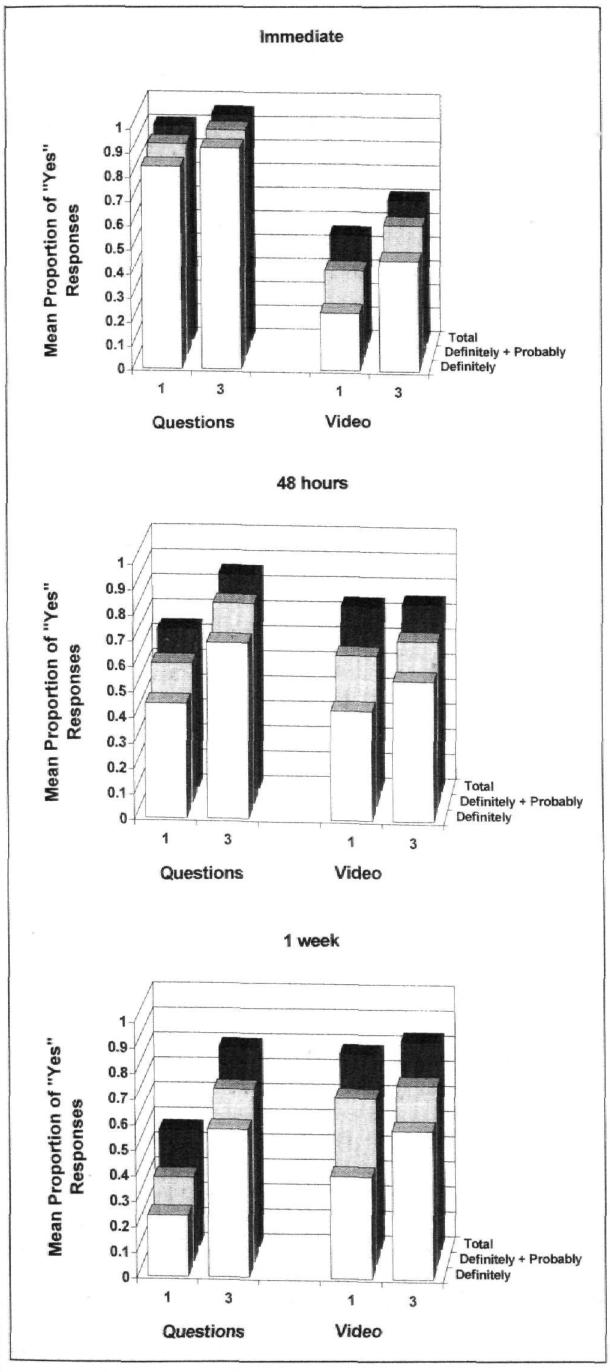

Fig. 2. Subjects' attributions of source ("yes" responses for "Questions?" and "Video?") for suggested items, conditionalized on recognition, as a function of number of exposures (one or three), retention interval, and confidence ("definitely yes"; "definitely yes" + "probably yes"; "Total," i.e., "definitely yes" + "probably yes" + "maybe yes").

the suggested events transpired; they were also more likely to experience these false memories as "real." The effects of repeated exposure were highly reliable and were observed over retention intervals as long as 1 week.

How might repeated exposure to suggestion lead subjects to misremember witnessing suggested events? The fact that subjects consciously recollected the suggested events implies that their memories had qualities similar to those of memories from actually witnessed events. We know from studies of source monitoring that subjects' tendency to attribute a memory to a witnessed event is based in part on the amount of distinctive sensory-perceptual detail associated with the memory (Johnson et al., 1993). It is likely that our procedure encouraged subjects to think about and imagine the suggested events, thus increasing the amount of sensory-perceptual detail contained in those memories. Recall that the misleading suggestions were embedded in questions that subjects were required to answer about the video. Answering such questions presumably required subjects to retrieve and reflect upon the events they saw. When the questions contained misleading suggestions, it is likely that subjects implicitly incorporated the suggested information into their imagined reconstructions of the witnessed event. With repetition, these images of suggested events probably became more elaborate and detailed (see Suengas & Johnson, 1988, for evidence that rehearsing imagined events serves to preserve and embellish them), thus increasing their similarity to records of actually witnessed events. In addition, it is likely that repetition increased the speed or fluency with which images of the suggested events could be generated by the subjects, thereby increasing subjects' confidence that the memories were real (cf. Kelley & Lindsay, 1993).

Our findings are related to a much broader literature documenting cognitive illusions that result from the misattribution of prior experiences to incorrect sources (e.g., Jacoby's false fame effect; see Jacoby, Kelley, & Dywan, 1989; and Schacter, for recent reviews of misattribution phenomena). However, there are several features that distinguish our results from previous research. First, the present study goes beyond delineating the conditions that produce illusory memories and identifies a factor that serves to increase misattribution errors. Recall that even single exposures to suggestion produced robust levels of false remembering. Second, our findings diverge from past research in that the factors that have most often been associated with misattribution errors in previous studies are those that serve to impair subjects' memory for source rather than improve it (e.g., divided attention—Jacoby, Woloshyn, & Kelley, 1989; delays—Lindsay, 1990; aging—Hashtroudi, Johnson, & Chrosniak, 1989; and amnesia—Schacter, Harbluk, & McLachlan, 1984). Finally, most previous studies of misattribution phenomena have used single exposures and have not explored the consequences of repeated presentation. A notable exception are studies of the *mere exposure effect*, in which subjects' ratings of how much they like a stimulus (e.g., photograph of a person) have been shown to increase with frequency of exposure (Zajonc, 1968). Whether the false memory effects observed here would continue to increase with additional exposures to suggestion is an important question for future research.

In conclusion, this study makes a unique contribution to the understanding of false memories because it clearly identifies

repetition as one factor that can boost the incidence of their occurrence. We note that the misleading suggestions employed in the present study were highly plausible in the context of the witnessed event, and involved the creation of false memories that varied in detail, not gist, from the original event. What is not clear from the present data is whether repetition would similarly facilitate the creation of false memories under circumstances in which subjects are initially unwilling to accept the suggestions. Finally, the current studies show that merely exposing subjects to repeated suggestion can have dire memorial consequences.[1] In contrast, recent studies designed to investigate the creation of false memories for entire events (e.g., Ceci, Crotteau Huffman, Smith, & Loftus, 1994; Ceci, Loftus, et al., 1994; Hyman & Billings, 1995; Hyman, Husband, & Billings, 1995; Hyman & Pentland, 1996; Loftus & Ketcham, 1994) have pressed subjects to generate details about a fictitious event over several interviews and under circumstances imbued with substantial demand (cf. Hyman et al., 1995). Whether repeated exposure alone can induce false memory for an entire event remains an important question for future research.

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1. We use the term "mere exposure" to contrast the present situation, in which subjects read the suggestions, with situations in which the subject overtly commits to, elaborates upon, or self-generates the suggestions. However, in this study, suggestions were not encountered in isolation, and in that sense were not "merely exposed." Rather, they were embedded in text that placed them in the context of events that actually transpired.