

The Role of Perceptual Elaboration and Individual Differences in the Creation of False Memories for Suggested Events

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SUMMARY

Witnesses who are exposed to false or misleading information in the course of an investigation are often asked follow-up questions designed to elicit more detailed information about the alleged objects/events. The results of the present study showed that pressing witnesses to elaborate on the perceptual characteristics of suggested events increased false memory for these events. Specifically, participants who were asked about the perceptual details of suggested events (e.g. their location, physical appearance, etc.) were much more likely to later claim they 'definitely' remembered witnessing the fictitious events than participants who were exposed to the same suggestions but were not probed about additional perceptual details. In addition, the present study examined the role of individual difference variables in susceptibility to suggestion. The results showed that scores on the Tellegen Absorption Scale (but not the Dissociative Experiences Scale and the Creative Imagination Scale) were correlated with susceptibility to false memory in this paradigm. Copyright © 2001 John Wiley & Sons, Ltd.

In recent years there has been an outpouring of research on the dangers of suggestive interviews and their potential for creating 'false memories'. Studies in a variety of domains have shown that people can be led to remember details and even entire events that they never actually experienced (e.g. Ceci *et al.*, 1994; Hyman and Pentland, 1996; Roediger and McDermott, 1995; Zaragoza and Mitchell, 1996; see Schacter, 1995, for a review). Moreover, some progress has been made in elucidating factors that, in combination with misleading suggestion, can further promote the creation of these memories. Prominent among these is the role of imagery as a catalyst for false memory formation. For example, there is evidence that both imagery ability (e.g. Dobson and Markham, 1993) and preference for an imagic cognitive style (e.g. Labelle *et al.*, 1990) are related to susceptibility to false memory creation. In addition, studies have shown that repeatedly instructing people to imagine fictitious childhood experiences increases their belief that these fictitious events actually occurred (Garry *et al.*, 1996; Hyman and Pentland, 1996; Hyman *et al.*, 1998; Paddock *et al.*, 1998; see also Goff and Roediger, 1998, for similar findings with memory for recently performed actions).

Why might imagery be associated with false memory creation? It is well documented that discriminating between imagination and reality can be difficult, especially when

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imagined events contain large numbers of features or characteristics that are typical of actually experienced events (e.g. Johnson and Raye, 1981; *Johnson et al.*, 1988). In the case of false memories, imagining a fictitious event likely results in a mental representation that closely resembles a real event, because the act of imagination involves creating a specific instantiation of the fictitious event in one's mind. To use an example from a study by Hyman and Pentland (1996), imagining that as a child I once spilled a punchbowl at a wedding probably involves creating a mental version of this incident that specifies such things as who was there, what they looked like, where the wedding took place, how I spilled the punchbowl, what the consequences were, how I felt about it, and so forth. In other words, imagining an event (in this example, a fictitious one) involves reflectively elaborating on an idea in a variety of ways so as to produce a more concrete, specific, and perceptually and semantically detailed version of the incident in one's mind. At a broader level, imagining a fictitious event likely renders the imagined event more familiar, available, and plausible, thus increasing the likelihood that one would accept the imagined event as a real one (see e.g. Garry *et al.*, 1996). Thus, there are probably multiple dimensions, both general (e.g. familiarity) and specific (e.g. sensory/perceptual detail) on which imagined events resemble real ones.

In the present study, we employed an eyewitness suggestibility paradigm to assess whether leading participants to reflectively elaborate on the perceptual characteristics of misleading suggestions would increase false memory for the suggested events. Investigating the role of perceptual elaboration in false memory creation was of interest for two reasons. First, as discussed above, although the association between imagery and false memory creation is well documented, the mechanisms by which imagery induces false memory are not yet well understood. Given that imagining a fictitious event likely involves a great deal of perceptual elaboration (as well as reflective elaboration on other dimensions) assessing whether perceptual elaboration alone might promote false memories will help establish whether it plays a role in the imagery/false memory relationship.

Apart from its potential role in imagery processes, assessing the possible link between perceptual elaboration and false memory is important for other reasons. Specifically, there are certain types of questioning, common to therapeutic interview situations, that may lead people to reflectively elaborate on the perceptual characteristics of suggested events, without explicitly asking them to do so. In particular, any line of questioning that presses witnesses to provide specific details of fictitious (or poorly remembered) events may induce them to spontaneously elaborate on the perceptual characteristics of these events. For example, consider a situation where a witness to a robbery is told by misinformed authorities that the thief was carrying a gun, even though the thief did not have a weapon. Upon hearing this information, the witness is likely to construct a mental representation of the thief carrying a fictitious gun. At some later point in the interview, the witness may be pressed to answer more specific questions about the fictitious gun, such as questions about the type of gun, where the thief carried it, and so forth. We propose that in the course of answering such questions, the witness may construct an increasingly specific and perceptually detailed version of the fictitious gun in his or her mind. For example, what may have started out as a rather vague representation of an gun may eventually become a detailed representation of the thief brandishing a 0.32-calibre pistol.

To the extent that pressing witnesses to provide detailed descriptions of fictitious or poorly remembered events encourages them to construct highly specific and perceptually embellished mental representations, this sort of questioning should lead to an increase in illusory memories for the suggested information. As discussed above, there is considerable

evidence that the greater the vividness, clarity, and detail associated with imagined events, the greater the likelihood that they will be confused for actually experienced events (see Johnson *et al.*, 1993, for a review). In addition, because people's efforts to reconstruct their past experiences typically occur spontaneously and unintentionally, witnesses are not likely to realize or later remember that they themselves generated the detailed mental representation of the suggested event (e.g. the thief carrying the gun), thus increasing the likelihood they would confuse it for something they actually saw (cf. Durso and Johnson, 1980).

Although there are good reasons to expect that pressing witnesses for additional details about fictitious events will increase suggestibility, it is nevertheless a distinct possibility that this sort of questioning will have the opposite effect, and reduce the incidence of false memory. This is because attempts to retrieve particular details about the suggested items – items that witnesses never in fact saw – may lead them to realize that their memory contains few specific details about the fictitious items. The realization that their memory is lacking in critical details may lead to lower confidence in the suggested information and may even lead some witnesses to reject the suggested information as false. Thus, an alternative possibility is that such follow-up questioning will encourage witnesses to more critically evaluate the quality of their memory for the fictitious information and increase their resistance to suggestion.

In summary, witnesses who are exposed to false or misleading information in the course of an investigation are often asked follow-up questions designed to elicit more detailed information about the alleged objects/events. However, it is not known whether suggestive interviews that press witnesses to elaborate on the perceptual characteristics of suggested events are any more or less misleading than interviews that expose witnesses to the same misinformation without probing for additional perceptual details. Moreover, because perceptual elaboration is an integral component of imagery processes, testing the link between perceptual elaboration and false memory should further our understanding of a potential mechanism by which imagery promotes false memory creation.

To investigate whether answering questions about the perceptual details of suggested events increases false memory, we modified the experimental paradigm used by Zaragoza and Mitchell (1996) in their study of repeated suggestion and false memory. Participants viewed a videotape depicting a house burglary, and one week later read a narrative account of the event. The narrative account, although largely accurate, contained eight misleading suggestions (e.g. the narrative stated that the thief stole a ring when in fact he did not steal any jewellery). For each participant, some of the suggestions appeared once and the others appeared three times. To implement the perceptual elaboration manipulation, follow-up questions were inserted at regular intervals throughout the narrative, and participants were instructed to answer the questions as they encountered them. In the Perceptual Elaboration Group, the questions always requested further information about the perceptual characteristics (e.g. location, physical appearance, etc.) of an item mentioned in the preceding sentence. Some of the questions were about actually perceived items, and others were about the suggested items. However, for sentences containing misleading suggestions (e.g. the ring), the follow-up question was always about the suggested item (e.g. Did he find the ring in the top drawer?). When a suggestion was repeated, participants answered a different question about the suggested item each time they encountered it (e.g. Was the ring in a box?, Did the ring have a gemstone?). In this way, we were able to assess the potential relationship between number of follow-up questions and false memory.

Two days later, participants completed a source memory test. The measure of false memory was participants' tendency to misremember witnessing the suggested items in the video. To assess whether answering the perceptual elaboration questions increased suggestibility, we compared the incidence of false memory in the Perceptual Elaboration Group to that of a No Elaboration Control Group. Note that one consequence of suggestive follow-up questioning is additional exposure to the suggested information (e.g. additional exposure to the presupposition that the thief stole a ring). Because previous studies have shown that false memory for suggested items increases as a function of number of *exposures* to the misleading suggestion (Zaragoza and Mitchell, 1996; Mitchell and Zaragoza, 1996), assessing whether perceptual elaboration promotes false memory requires a design that controls for the effects of exposure to suggestion. To this end, participants in the No Elaboration Group were treated identically to participants in the Perceptual Elaboration Group, with the exception that they answered quite different follow-up questions. Thus, participants in both groups read the same narratives and answered the same number of questions about the suggested items. However, the follow-up questions employed in the No Elaboration Group were designed to ensure that participants spent additional time processing the suggested item without further elaborating on their mental representation of the suggested item. Because such perceptual elaboration may occur spontaneously whenever participants process the misleading suggestion in a meaningful way, the follow-up questions focused on very superficial aspects of the misleading suggestion, such as its rhyming characteristics or the grammaticality of the misleading statement. For example, following the sentence containing the misleading suggestion that the thief stole a ring, some participants in the control group were asked the follow-up question, 'What word in the sentence rhymes with 'sing'?'

A second objective of this study was to assess the potential role of personality or individual difference variables in the creation of false memories for suggested events. In particular, we hypothesized that there might be individual differences in the extent to which perceptual elaboration questions would increase false memory. As discussed above, the extent to which such questioning will increase false memory should be highly dependent on people's tendency to generate and embellish mentally constructed versions of the suggested events. We hypothesized, therefore, that susceptibility to false memory in this situation would be related to the personality variables of absorption, imaginative involvement, and suspension of reality testing. Thus we employed three, partially overlapping, individual difference measures related to imagery, absorption and suggestibility: the Tellegen Absorption Scale (Tellegen, 1982, unpublished manuscript), the Dissociative Experiences Scale (Bernstein and Putnam, 1986), and the Creative Imagination Scale (Wilson and Barber, 1978). For each of these measures there is some, albeit limited, empirical evidence of a relationship with susceptibility to false memory.

The Tellegen Absorption Scale (TAS; Tellegen, 1982, unpublished manuscript) consists of 34 'true-false' questions concerning the individual's readiness for experiences of deep involvement in either internal or external events. According to Tellegen (1981, 1982, unpublished manuscript) the scale consists of nine clusters: responsiveness to engaging stimuli, responsiveness to inductive stimuli, often thinking in images, ability to summon vivid and suggestive images, having 'cross-modal' experiences, becoming absorbed in one's own thoughts and imaginings, vividly re-experiencing the past, having episodes of expanded awareness, and experiencing altered states of consciousness. Absorption as measured by the TAS correlates with a range of variables including hypnotizability, imagery, and fantasy proneness (see Roche and McConkey, 1990, for a review). In a recent

study, Platt *et al.* (1998) reported a correlation between TAS score and naturally occurring distortions in autobiographical memory, in this case, distortions in participants' memories of how they first heard about the verdict in the O.J. Simpson trial.

The second measure of interest, the Dissociative Experiences Scale (DES; Bernstein and Putnam, 1986), is a self-report measure that assesses the extent to which individuals have dissociative experiences. There is considerable empirical support for a relationship between dissociative tendencies and susceptibility to memory illusions, including word list intrusions (Winograd *et al.*, 1998) imagination inflation effects (Paddock *et al.*, 1998), and the creation of false memories for entire autobiographical events (Hyman and Billings, 1998).

The Creative Imagination Scale (CIS; Wilson and Barber, 1978), is a measure of suggestibility and imaginal ability that involves leading participants through a series of guided imagery tasks and asking them to rate the similarity between the imagined events and the corresponding real life experiences. The CIS is associated with other measures of imagery and absorption such as the TAS and Bett's Test of Mental Imagery. Hyman and Billings (1998) reported a correlation between CIS score and the creation of false childhood memories.

METHOD

Participants and design

Data from 214 general psychology students from Kent State University were initially collected. All participants received course credit, and were randomly assigned to either the Perceptual Elaboration Group or the No Elaboration Group. Data from 27 participants were discarded due to missing responses (on either the postevent question task or the source test) or failure to follow instructions (on the question task or the source test). Thirty-eight participants did not complete all three sessions. Finally, the data from 17 participants (7 from the Perceptual Elaboration Group and 10 from the No Elaboration Group) were excluded to ensure proper counterbalancing.¹ Thus, source test data from one hundred and thirty-two participants were analysed, with equal numbers of participants in each group. A 2 (Perceptual Elaboration versus No Elaboration) \times 2 (1 versus 3 exposures) mixed design was implemented. Group functioned as a between-participants factor and exposures as a within-participants factor.

MATERIALS AND PROCEDURE

Individuals participated in small groups of one to fifteen people. They were told that they would watch a brief video and perform a variety of other cognitive tasks.

Phase I – The eyewitness event and DES

Participants viewed a 5-minute clip of a burglary, taken from an Ohio Police training video. In the segment, a young man stole several objects from a house, and was later

¹In order to maximize power, the data from these 17 participants were included in the correlational analyses conducted on the personality measures. We note that the pattern of results on the source test are identical when these 17 participants are included in the ANOVA.

caught by the police after a car chase. After viewing the video, a second experimenter took over the session and asked the participants to complete a questionnaire. She passed out the Dissociative Experiences Scale and read the instructions (included in the scale). Participants were allowed as much time as needed to complete the measure.

Phase 2 – Exposure to misleading suggestions and follow-up questioning

One week after seeing the video, participants read a narrative that described each of 12 scenes from the video. Some of the statements were misleading in that they presupposed the existence of objects or events that, although plausible (cf. Pezdek *et al.*, 1997), were clearly not in the video (e.g. the thief stole a ring). Each participant was exposed to eight misleading suggestions, with each corresponding to a distinct scene from the video (see the Appendix for a complete listing of the suggestions). For each participant, four suggestions appeared once, and the other suggestions appeared three times. Across the experiment, each of the eight suggestions occurred equally often in the one- and three-exposure conditions.

To implement the repeated suggestions manipulation, the narrative account reviewed the 12 scenes from the video in chronological order three times successively, each time using slightly different wording and emphasizing slightly different aspects of the same scenes. Suggestions assigned to the three-exposure condition were embedded in each of the three descriptions of the relevant scene. Suggestions assigned to the one-exposure condition were embedded in the second of the three descriptions of the relevant scene.

The description of each scene was projected individually on the wall in front of the participants through a liquid crystal display. Participants were instructed to read each statement as a taped voice read it aloud. (We used this procedure to equate exposure time to the suggested items across participants.) Immediately after reading the description of each scene, participants had 15 seconds to answer a follow-up question that probed for further information about an item or event described in the preceding sentence. Participants were instructed to answer every follow-up question, even if they had to guess. If the description contained a misleading suggestion, the follow-up question was always about the suggested item; otherwise the follow-up question was about an actually perceived item. For participants in the Perceptual Elaboration Group the follow-up questions probed for information about the perceptual characteristics of the target item. There were three types of perceptual elaboration questions: (1) questions about the location of the target item, (2) questions about the physical appearance of the target item, and (3) questions that probed for additional information about the physical context in which the target item occurred (see the Appendix for a complete listing of the perceptual elaboration questions that followed the misleading suggestions). For participants in the No Elaboration Group, the follow-up questions were designed to induce participants to continue processing the suggested items, but in a superficial way. Three types of follow-up questions were employed in the No Elaboration condition: (1) a rhyming task, (2) an unscrambling task, and (3) a grammaticality judgement task. Table 1 provides an example of the follow-up questions used in each group. As can be seen in the table for misleading statements, the correct answer to the rhyming and unscrambling tasks was always the misleading suggestion. The grammaticality task was somewhat different, in that it involved deciding whether the statement would still be grammatically correct if the phrase containing the misleading suggestion was deleted. All participants in each group received all three question types, and their order of presentation was counterbalanced. The suggested items always appeared in both the statement and the follow-up question.

Table 1. Example of follow-up questions used in each group for the misleading suggestion ‘Gun’ (three-exposure condition)

8. Later, as he was leaving the house, the thief put his hand on the gun at his waist, looked both ways and went out the door.

Perceptual Elaboration Group

Location:

Exactly where on the thief’s waist was the gun located (e.g. front, side, back)?

No Elaboration Group

Rhyming:

Find a word in the statement which rhymes with the word below:
fun

20. Later the thief checked the gun at his waist and left out the back door, slamming it behind himself.

Perceptual Elaboration Group

Physical description:

Was the handle of the gun showing?

No Elaboration Group

Unscramble:

Unscramble the following letters to form a word from the sentence:
nug

32. The thief was shown leaving the house with a camera bag and a white pillow case. At the door, he put his hand on his gun, looked both ways and walked out.

Perceptual Elaboration Group

Additional information:

Was the gun in a holster?

No Elaboration Group

Grammar:

If you remove the words, ‘at the door, he put his hand on his gun’ from this sentence is it still grammatically correct?

After participants had finished answering the follow-up questions, they were asked by a second experimenter to complete another questionnaire. The Tellegen Absorption Scale (Tellegen, 1982, unpublished manuscript) was then administered.

Phase 3 – Source memory test and CIS

Two days later, participants were given a surprise source memory test. This consisted of 32 items which were read on a tape recorder at a rate of 8 seconds per item. Eight of these were the suggested items and the other 24 were filler items, eight from each of three other sources (video only, both video and statements, neither video nor statements). The filler items were chosen to be relatively obvious members of their source categories. Participants were provided with two headings on their answer sheets, one labelled ‘video’ and the other ‘statements’. For each test item, participants had two tasks to perform. First, they were required to indicate whether they remembered the item from the video, and second they were required to indicate whether they remembered the item from the statements. For each of these source probes, participants were asked to indicate their answer by selecting a response from a seven point Likert-type scale with the choices: definitely yes, probably yes, maybe yes, unsure, maybe no, probably no, and definitely no. Participants were instructed to circle one confidence choice under each heading for each test item.

Instructions were given orally but participants were also provided with written instructions so that they could read along with the experimenter. Prior to taking the test, participants were accurately informed that some of the items in the statements were not in the video, and that the items on the source test came from four different sources (video

only, statements only, video and statements, neither video nor statements). They were also informed that their task was to indicate what they remembered about the source of each test item. The provision of these instructions should have minimized any tendency for participants to claim they remembered events they did not witness simply because they assumed the questionnaire was accurate, or because of perceived demand to conform to the information provided during the postevent questioning.

After completing the source test, the Creative Imagination Scale (Wilson and Barber, 1978) was administered. Each guided imagery task was presented by a taperecorded male voice.

RESULTS

Perceptual elaboration and false memory for suggested events

For all analyses, reliability was at the $p < 0.01$ level unless noted. This study was designed to examine the effect of perceptual elaboration on the creation of false memories for suggested events. Thus, the measure of primary interest was the proportion of suggested items participants misattributed to the video. Thus a 'yes' response to the 'In Video' prompt for a misleading item was a source misattribution error (i.e. the measure of false memory). In contrast, a 'yes' response to the 'In Statements' prompt for a misleading item was a correct response, since all of the misleading items were mentioned in the statements. Note that it was possible for participants to respond 'yes' to both prompts, thus making both an error and a correct response simultaneously.

Figure 1 shows the mean proportion of times participants in each of the two groups incorrectly claimed to remember seeing the suggested items in the video, as a function of exposure level (1 versus 3) and confidence in the response (maybe, probably, definitely). The results provide strong support for the hypothesis that perceptual elaboration increases false memory for suggested items. Participants in the Perceptual Elaboration Group made significantly more misattribution errors than those in the No Elaboration Group. This is true both when one considers all 'yes' responses – the sum of the proportion of 'maybe yes', 'probably yes', and 'definitely yes' responses to the Video test probe- ($M_s = 0.61$ ($SD = 0.26$) and 0.83 ($SD = 0.22$) for the No Elaboration and Perceptual Elaboration groups, respectively, $F(1,130) = 34.584$, $MS_e = 0.086$), and when one restricts the analysis to the proportion of 'definitely yes' responses - the errors made with very high confidence ($M_s = 0.35$ ($SD = 0.28$) and 0.61 ($SD = 0.32$) for the No Elaboration and Perceptual Elaboration groups, respectively, $F(1,130) = 33.343$, $MS_e = 0.143$). The results also replicate the finding that repeated suggestion alone leads to robust increases in suggestibility, (cf. Zaragoza and Mitchell, 1996). In both groups, misattribution errors increased as a function of exposure ($M_s = 0.62$ ($SD = 0.26$) and 0.82 ($SD = 0.21$)) for the one- and three- exposure items, respectively, $F(1,130) = 80.109$, ($MS_e = 0.032$). Importantly, the interaction between repeated exposure and perceptual elaboration was not reliable, thus showing that each of these factors independently contributed to false memory errors.

Table 2 provides a more complete picture of how the perceptual elaboration manipulation influenced memory for the suggested items, by showing how participants in both groups distributed their responses to the two source probes (i.e. the proportion of times participants responded 'yes' to both probes, 'yes' to video and 'no' to statements, 'no' to

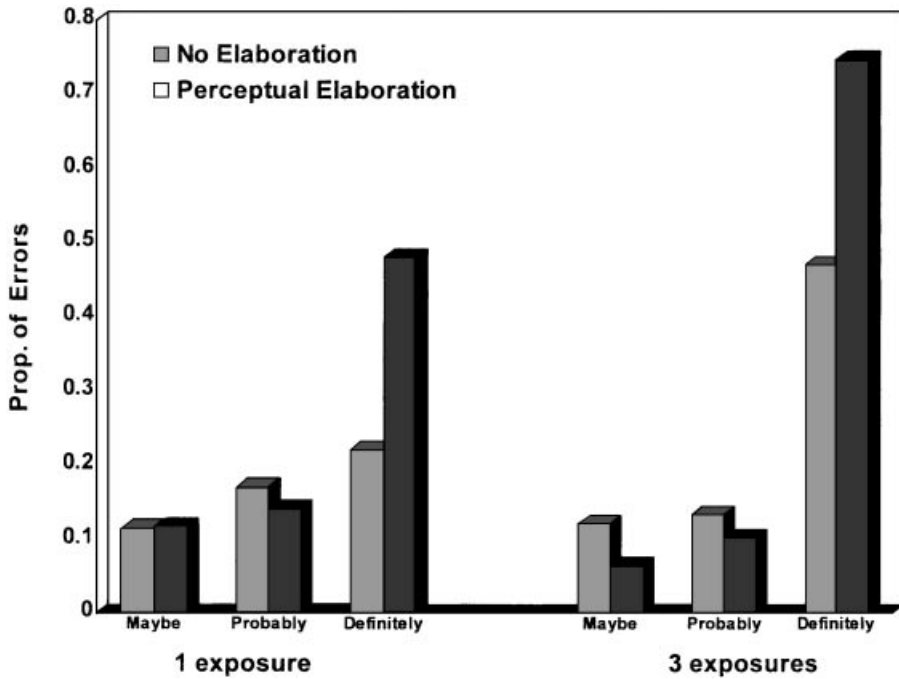


Figure 1. Proportion of suggested items misattributed to the video in the Perceptual Elaboration and No Elaboration groups, as a function of exposure level and confidence in the response

video and ‘yes’ to statements, and ‘no’ to both probes), as function of exposure and group. Inspection of this table reveals that in addition to increasing misattributions to the video, perceptual elaboration also increased correct attributions to the statements, as evidenced by the much greater proportion of ‘yes in video/yes in statements’ responses to the suggested items in the Perceptual Elaboration Group. Analysis of participants responses to the ‘In statements?’ probe confirms that the Perceptual Elaboration Group made more ‘yes’ responses than the No Elaboration Group ($M_s = 0.66$ ($SD = 0.25$) and 0.82 ($SD = 0.21$) for the No Elaboration and Perceptual Elaboration groups, respectively, ($F(1,130) = 24.122$, ($MS_e = 0.071$), as well as more ‘definitely yes’ responses ($M_s = 0.49$ ($SD = 0.29$) and 0.71 ($SD = 0.27$) for the No Elaboration and Perceptual Elaboration

Table 2. Distribution of ‘yes’ and ‘no’ responses to video and statement source probes for suggested items as a function of exposure level and group

	Yes video/ YES stat.	Yes video/ NO stat.	No video/ YES stat. ^a	No video/ NO stat.
One exposure				
No Elaboration	0.36	0.15	0.17	0.33
Perceptual Elaboration	0.58	0.15	0.11	0.15
Three exposures				
No Elaboration	0.65	0.07	0.15	0.13
Perceptual Elaboration	0.89	0.02	0.06	0.03

^aCompletely correct response.

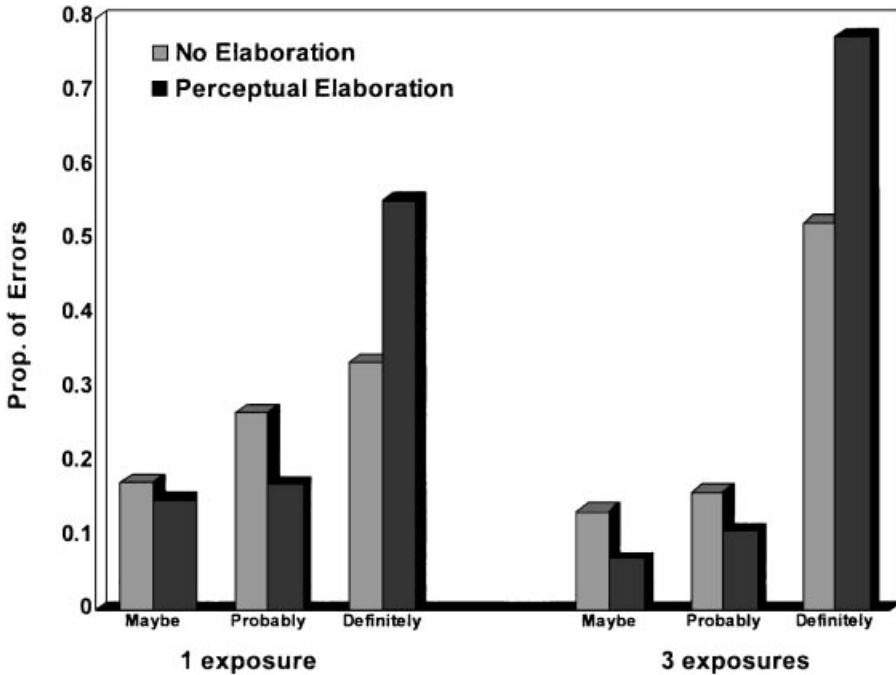


Figure 2. Proportion of recognized suggested items misattributed to the video in the Perceptual Elaboration and No Elaboration groups, as a function of exposure level and confidence in the response

groups, respectively, $F(1,130) = 29.18$, $MS_e = 0.111$). Not surprisingly, repeated exposure also increased correct attributions to the statements. For both total 'yes' and 'definitely yes' responses, participants' ability to remember having encountered the suggestions in the statements was significantly higher for the three exposure items relative to the one exposure items ($Ms = 0.60$ ($SD = 0.26$) and 0.88 ($SD = 0.20$) for total 'yes' responses, $F(1,130) = 145.39$, ($MS_e = 0.035$; and $Ms = 0.42$ ($SD = 0.29$) and 0.77 ($SD = 0.27$) for 'definitely yes' response, $F(1,130) = 172.278$, $MS_e = 0.045$). Thus, both repeated exposure and perceptual elaboration have the paradoxical effect of increasing false memory while improving memory for the suggested item's true source.

Another difference between the groups was that the Perceptual Elaboration Group had a lower proportion of 'no video/no statement' responses than the No Elaboration Group (see right-hand column of Table 2). Note that a 'no video/no statement' response indicates that the participant does not remember encountering the suggested item in the context of the experiment at all. Thus, one consequence of the perceptual elaboration manipulation was that it reduced forgetting of the misleading suggestions. An ANOVA conducted on the 'no video/no statement' responses revealed that the group difference was highly reliable, $F(1,130) = 30.895$, ($MS_e = 0.044$), although this difference was greater for the one-exposure items than the three-exposure items (as evidenced by a reliable group \times exposure interaction, $F(1,130) = 6.079$, ($MS_e = 0.026$, $p < 0.05$). Not surprisingly, repeated exposure also reduced forgetting of the suggested item ($F(1,130) = 72.842$, ($MS_e = 0.026$).

Because participants in the No Elaboration Group remembered fewer suggested items, it is unclear to what extent the lower incidence of misattribution errors in this group is simply a result of their greater tendency to forget the misleading suggestions altogether. To

address this issue, for each group, we computed the proportion of recognized suggestions (i.e. those identified as begin from one or more of the experimental sources: video, questions, or both) that were misattributed to the video.

As can be seen in Figure 2, conditionalizing the data on recognition does not change the pattern of results. Relative to no elaboration, perceptual elaboration increased false memory for suggested events, and it did so whether one considers all ‘yes’ responses ($F(1,130) = 9.421, MS_e = 0.089$) or one restricts the analysis to ‘definitely yes’ responses ($F(1,130) = 19.458, MS_e = 0.187$). Once again, repeated exposure to suggestion led to a reliable increase in misattribution errors ($F(1,130) = 7.246, MS_e = 0.030$) and the group \times exposure interaction was not reliable. Thus, the increase in false memory in the Perceptual Elaboration Group is not simply a function of less forgetting of the misleading suggestions in the Perceptual Elaboration Group. When the analysis is restricted to those instances where participants remember the content of the suggestions, there is a higher incidence of false memory errors in the Perceptual Elaboration Group than in the No Elaboration Group.

The only change that resulted from conditionalizing the data was that the group difference in correct attributions to the statements (total ‘yes’ responses) was no longer reliable ($p > 0.10$), although the Perceptual Elaboration Group continued to show an advantage over the No Elaboration Group in ‘definite’ attributions to the statements, $Ms = 0.59 (SD = 0.34)$ and $0.76 (SD = 0.28)$, ($F(1,130) = 13.957$), ($MS_e = 0.135$).

The foregoing analyses have focused on participants’ responses to the suggested items that appeared in the post-event statements. Recall, however, that the source test also contained filler items from three other source categories: (a) items that had been in the video but not in the statements (Saw Only Items), (b) items that appeared in both the video and the statements (Both Items) and (c) items that had been in neither the video nor the statements (Neither Items). As can be seen in Table 3, the Perceptual Elaboration and No Elaboration groups did not differ in their responses to the filler items (all $ps > 0.05$). This indicates that both memory for the events of the video (as indicated by responses to Saw

Table 3. Distribution of ‘yes’ and ‘no’ responses to video and statement source probes for each type of filler item as a function of group

<i>Saw only items</i>				
	Yes video/ YES stat.	Yes video/ NO stat. ^a	No video/ YES stat.	No video/ NO stat.
No elaboration	0.18	0.44	0.01	0.37
Perceptual Elaboration	0.23	0.41	0.01	0.35
<i>Both items</i>				
	Yes video/ YES stat. ^a	Yes video/ NO stat.	No video/ YES stat.	No video/ NO stat.
No Elaboration	0.48	0.28	0.05	0.19
Perceptual Elaboration	0.53	0.30	0.01	0.16
<i>Neither items</i>				
	Yes video/ YES stat.	Yes video/ NO stat.	No video/ YES stat.	No video/ NO stat. ^a
No Elaboration	0.03	0.08	0.01	0.88
Perceptual Elaboration	0.03	0.08	0.02	0.87

^aCompletely correct response.

Only and Both Items), and the base rate of false alarms (as indicated by responses to the Neither Items) were comparable for the two groups. More importantly, the results show that the perceptual elaboration manipulation did not have broad effects on memory or test performance. Rather, it selectively influenced participants' memory for the suggested items.

Individual differences in suggestibility

To assess potential individual differences in susceptibility to false memory, the correlation between source misattribution errors and scores on the three personality measures (DES, TAS, and CIS) were computed. Two measures of false memory were employed: total 'yes' responses and 'definitely yes' responses. For each measure of false memory, we first analysed the entire data set (without regard to group membership or exposure level of the suggested item) and then analysed successively smaller subcategories of the data (see Table 4). Specifically, following the overall analysis, separate correlations were computed for (1) all one-exposure items and all three-exposure items (collapsing across group), (2) the No Elaboration and Perceptual Elaboration groups, and (3) the one- and three-exposure items within each group. As can be seen in Table 4, of the three personality measures, only the TAS correlated significantly with suggestibility errors, although the relationship between the TAS and suggestibility was significant for 'definite' errors only. Specifically, there was a significant correlation between the TAS and 'definitely yes' responses in general ($r=0.181$, $p < 0.05$). However, when the groups were analysed separately, there was some evidence that the TAS predicted suggestibility in the Perceptual

Table 4. Intercorrelations between personality measures and false memory for suggested items

	DES	TAS	CIS
<i>Total errors</i>			
Errors PE & NE ($N = 149$) ^a	0.072	0.137	0.055
One exposure ($N = 149$)	0.088	0.134	0.079
Three exposures ($N = 149$)	0.036	0.107	0.012
Errors PE	0.117	0.155	0.047
One exposure ($N = 73$)	0.137	0.194	0.055
Three exposures ($N = 73$)	0.043	0.037	0.016
Errors NE	0.106	0.093	0.101
One exposure ($N = 76$)	0.106	0.049	0.142
Three exposures ($N = 76$)	0.078	0.115	0.032
<i>High confidence errors</i>			
Def errors PE & NE ($N = 149$)	0.014	0.181**	0.055
One exposure ($N = 149$)	0.128	0.011	0.013
Three exposures ($N = 149$)	0.012	0.192**	0.082
Def. errors PE	0.084	0.219*	0.086
One exposure ($N = 73$)	0.075	0.166	0.039
Three exposures ($N = 73$)	0.072	0.218*	0.111
Def. errors NE	-0.005	0.121	0.069
One exposure ($N = 76$)	-0.012	0.046	0.010
Three exposures ($N = 76$)	0.001	0.149	0.096

PE = perceptual elaboration group, NE = no elaboration group.

* $p < 0.07$, ** $p < 0.05$.

^aReflects number of subjects for TAS analysis.

Elaboration Group, but no evidence that it did so in the No Elaboration Group. Specifically, both overall definite errors in the Perceptual Elaboration Group, and three exposure definite errors in the same group produced a correlation with the TAS that was marginally reliable ($p = 0.06$). In contrast, definite errors in the No Elaboration Group did not correlate with the TAS. Note that a t -test of TAS score by group revealed no significant baseline differences between the groups ($p = 0.394$).

DISCUSSION

The results of the present study support the conclusion that pressing witnesses to answer questions about the perceptual details of suggested events increases false memory for the fictitious events. Participants who answered questions that encouraged them to elaborate on the perceptual characteristics of the suggested items, such as their location and physical appearance, were much more likely to later claim they 'definitely' remembered seeing the suggested items in the video than were participants who were exposed to the same suggestions, but were not probed for additional details. Thus, the present study is the first to identify *perceptual elaboration* as a catalyst to false memory creation. We propose that answering perceptual elaboration questions increased false memory because it induced participants to form a more perceptually detailed, specific, and embellished representation of the suggested items/events than they otherwise would have done.

The finding that the Perceptual Elaboration Group committed more errors than a No Elaboration comparison group that had equal exposure to the suggested information provides strong evidence for the conclusion that it was the nature of the processing, rather than the amount, that led to the increase in false memory. We note, however, that the present results do not establish with certainty that it was the perceptual aspects of the elaborative processing that produced the increase in false memory. Because perceptual elaboration is inherently meaningful elaboration, our findings that the Perceptual Elaboration Group produced more errors than the No Elaboration Group (who engaged in shallow, relatively non-meaningful follow-up processing of the suggested items) cannot rule out the possibility that it was the meaningfulness of the elaboration, rather than its perceptual nature *per se*, that produced the effects reported here. Whether perceptual elaboration leads to greater increases in false memory than other types of meaningful elaboration is an issue we are currently investigating in our laboratory (Zaragoza *et al.*, 1997).

One aspect of the results that may, at first glance, seem inconsistent with the conclusion that perceptual elaboration increases suggestibility was the high rate of false memory in the No Elaboration Group, especially in the three-exposure condition. However, the error rate of the No Elaboration Group is not surprising once one recognizes that participants in the No Elaboration Group were exposed to misleading suggestions in the context of a narrative that probably induced some implicit imaginal and elaborative processes. Specifically, the misleading suggestions were embedded in a very rich and detailed narrative account of the witnessed event. Moreover, the narrative was written in such a way as to make the suggestions 'fit' with the events that actually transpired. In accordance with contemporary theories of language comprehension, we assume that when reading the post-event narrative participants in the No Elaboration Group spontaneously constructed a specific mental representation, or 'mental model' of the events (both true and suggested) described in the statements (see, for example, Glenberg *et al.*, 1994), a process that involves some reflective elaboration. In fact, we have argued elsewhere (Zaragoza and

Mitchell, 1996; Mitchell and Zaragoza, 1996) that repeated exposure to suggestion increases false memory because it provides multiple opportunities for participants to reflectively elaborate on the suggested events. Thus, the question addressed by the present study is whether reflective elaboration that goes beyond that which is induced by reading the misleading narrative increases false memory.

Interestingly, there was no evidence that repetition interacted with perceptual elaboration. One might have expected that the increase in false memory following three perceptual elaboration questions would be greater than the increase that followed one. However, the failure to obtain a reliable interaction must be interpreted with caution given the extremely high error rate in the three-exposure condition of the Perceptual Elaboration Group – the proportion of recognized suggestions misattributed to the video was 0.91. Thus, the combined effects of repetition and perceptual elaboration may have produced error rates that were near ceiling. One factor that likely contributed to this high error rate was the one-week retention interval between the witnessed event and the suggestive questioning. Presumably, the delay weakened participants' memory for the details of the witnessed event. In the absence of clearly remembered information that could verify or disconfirm the accuracy of the suggested items, participants may have been predisposed to accept the suggested items as potentially 'true', thus rendering their memories more susceptible to the effects of repeated suggestion and perceptual elaboration. (In the light of the high error rate, it is noteworthy that participants were informed before the source test that some of the information in the statements was not in the video. Apparently, this warning was not sufficient to reverse the memory distorting effects of the repeated suggestive questioning). Thus, the present study needs to be replicated and extended to situations where there is greater resistance to suggestion before firm conclusions can be drawn about the effects of repeated perceptual elaboration on suggestibility.

The second main finding of interest was the significant correlation between TAS score and 'definitely yes' errors (although the correlations were rather low). Participants who scored high on the TAS were more likely to make errors with high confidence, especially if they were in the Perceptual Elaboration Group. However, in contrast to the results of Hyman and Billings (1998), we found no evidence that the DES and CIS were related to false memory creation. However, the types of false memories investigated by Hyman and Billings were much larger in scope and more personally relevant than those documented here. Specifically, Hyman and Billings led participants to imagine, and eventually create, memories for entire fictitious events from their childhood. Not surprisingly, people's susceptibility to false memories of entire autobiographical events (such as those investigated by Hyman and Billings) is much lower than their susceptibility to forming a false memory for an aspect of an experienced event (such as those investigated here). Hence, the tendency to dissociate from reality may be more predictive of susceptibility to the sort of extreme memory errors documented by Hyman and colleagues. In contrast, the sorts of source confusion errors documented in the present study are more commonplace, and are largely the by product of normal cognitive processes.

It is easy to see why absorption might be related to memory illusions that come about as a consequence of incidental, as opposed to intentional, reflective processes. We have argued that reflective elaboration of suggested events occurs spontaneously when participants attempt to answer detailed and specific questions about the suggested events. Presumably, the tendency to become engrossed and totally absorbed in one's thoughts and imaginings will influence the amount of reflective elaboration that spontaneously occurs. Those who are high in absorption are likely to generate and embellish mentally

constructed versions of suggested events with ease, thus rendering the memories of these constructed events especially susceptible to misattribution.

In conclusion, the results of the present study add to the growing literature on the role of reflective elaboration in false memory creation. The contribution of the present study is that it calls attention to the dangers of implicit reflective elaboration processes that naturally occur when witnesses are pressed to provide details of poorly remembered or fictitious events. As William James noted some time ago, ‘... whilst part of what we perceive comes through our senses from the object before us, another always comes from our head’ (James, 1890, Vol. II, p. 103). Unfortunately, as demonstrated by the results of the present study, ‘what goes on in our heads’ can also distort our recollections of past experiences.

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REFERENCES

- Bernstein EM, Putnam FW. 1986. Development, reliability, and validity of a dissociation scale. *The Journal of Nervous and Mental Disease* **174**: 727–735.
- Ceci SJ, Crotteau ML, Smith E, Loftus EF. 1994. Repeatedly thinking about a non-event: Source misattributions among preschoolers. *Consciousness and Cognition* **3**: 388–407.
- Dobson M, Markham R. 1993. Imagery ability and source monitoring: Implications for eyewitness memory. *British Journal of Psychology* **32**: 111–118.
- Durso FT, Johnson MK. 1980. The effects of orienting task on recognition, recall, and modality confusion of pictures and words. *Journal of Verbal Learning and Verbal Behavior* **19**: 416–429.
- Garry M, Manning CG, Loftus EF, Sherman SJ. 1996. Imagination inflation: Imagining a childhood event inflates confidence that it occurred. *Psychonomic Bulletin & Review* **3**: 208–214.
- Glenberg AM, Kruley P, Langston WE. 1994. Analogical processes in comprehension: Simulation of a mental model. In *Handbook of Psycholinguistics*. Gernsbacher MA (ed.). Academic Press: San Diego, CA; 609–640.
- Goff LM, Roediger HL. 1998. Imagination inflation for action events: Repeated imaginings lead to illusory recollections. *Memory & Cognition* **26**: 20–33.
- Hyman IR, Billings FJ. 1998. Individual differences and the creation of false childhood memories. *Memory* **6**: 1–20.
- Hyman IR Jr., Gilstrap LL, Decker KL, Wilkinson CL. 1998. Manipulating remember versus know judgements in autobiographical memories. *Applied Cognitive Psychology* **12**: 371–386.
- Hyman IR, Pentland J. 1996. The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language* **35**: 101–117.
- James W. 1890. *Principles of Psychology*. Henry & Holt: New York.
- Johnson MK, Hashtroudi S, Lindsay DS. 1993. Source monitoring. *Psychological Bulletin* **112**: 3–28.
- Johnson MK, Raye CL, Wang AY, Taylor TH. 1979. Fact and fantasy: The roles of accuracy and variability in confusing imaginations with perceptual experiences. *Journal of Experimental Psychology: Human Learning & Memory* **5**: 229–240.
- Johnson MK, Raye CL. 1981. Reality monitoring. *Psychological Review* **88**: 67.

- Johnson MK, Foley MA, Leach K. 1988. The consequence for memory of imagining in another person's voice. *Memory & Cognition* **16**: 337–342.
- Labelle L, Laurence J, Nadon R, Perry C. 1990. Hypnotizability, preference for imagic cognitive style, and memory creation in hypnosis. *Journal of Abnormal Psychology* **99**: 222–228.
- Mitchell KJ, Zaragoza MS. 1996. Repeated exposure to suggestion and false memory: The role of contextual variability. *Journal of Memory and Language* **35**: 246–260.
- Paddock JR, Joseph AL, Chan FM, Terranova S, Manning C, Loftus EF. 1998. *Applied Cognitive Psychology* **12**: 63–75.
- Pezdek K, Finger K, Hodge D. 1997. Planting false childhood memories: The role of event plausibility. *Psychological Science* **8**: 437–441.
- Platt RD, Lacey SC, Tobst AD, Finkleman D. 1998. Absorption, dissociation, and fantasy proneness as predictors of memory distortion in autobiographical and laboratory-generated memories. *Applied Cognitive Psychology* **12**: 77–89.
- Roche SM, McConkey KM. 1990. Absorption: Nature, assessment, and correlates. *Journal of Personality and Social Psychology* **59**: 91–101.
- Roediger HL, McDermott KB. 1995. Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition* **21**: 803–814.
- Schacter DL. 1995. Memory distortions: History and current status. In *Memory Distortion: How Minds, Brains, and Societies Reconstruct the Past*, Schacter DL, Coyle JT, Fischbach GD, Mesulam MM, Sullivan LE (eds). Harvard University Press: Cambridge, MA; 1–43.
- Tellegen A. 1981. Practising the two disciplines for relaxation and enlightenment: Comment on 'Role of the feedback signal in electromyograph biofeedback: The relevance of attention' by Qualls and Sheehan. *Journal of Experimental Psychology: General* **110**: 217–226.
- Tellegen A. 1982. Brief manual for the multidimensional personality questionnaire. unpublished manuscript. University of Minnesota, Minneapolis.
- Wilson SC, Barber TX. 1978. The Creative Imagination Scale as a measure of hypnotic responsiveness: Applications to experimental and clinical hypnosis. *American Journal of Clinical Hypnosis* **20**: 235–249.
- Winograd E, Peluso JP, Glover TA. 1998. Individual differences in susceptibility to memory illusions. *Applied Cognitive Psychology* **12**: 5–27.
- Zaragoza MS, Mitchell KJ. 1996. Repeated exposure to suggestion and the creation of false memories. *Psychological Science* **7**: 294–300.
- Zaragoza MS, Mitchell KJ, Drivdahl SB. 1997. Imagery and False memory creation. In *Recollections of Trauma Scientific evidence and clinical practice*, Read JD, Lindsay DS (eds). Plenum Press: New York; 585.

APPENDIX: FOLLOW-UP QUESTIONS FOR MISLEADING ITEMS

The thief wore gloves.

When the thief entered the bedroom was he still wearing his gloves? (*location*)

Did the gloves fit snugly or were they loose? (*additional information*)

What colour were the gloves? (*physical description*)

The thief stole a ring.

Was the ring in the top drawer?

Was the ring in a box?

Did the ring have a gemstone?

There was a barking dog.

Was the barking dog in the neighbour's yard?

Was the dog on a chain?

How large was the dog?

The police officer had a Coke.

Was the Coke on the dashboard?

Was the Coke diet or regular?

Was the Coke in a can or a bottle?

Thief pulled a window shade down.

Was the shade behind the curtain?

Was the shade difficult to put down?

What condition was the shade in (e.g. worn, new, torn etc.)?

The driver smoked a cigarette.

Did the driver get out of the car to finish smoking the cigarette?

Did he finish smoking the cigarette before his friend returned?

Did the cigarette have a filter?

The thief had a gun.

Exactly where on the thief's waist was the gun located (e.g. front, side, back)?

Was the gun in a holster?

Was the handle of the gun showing?

The thieves jumped the kerb with the car.

Did they end up on the sidewalk when the driver jumped the kerb?

About how fast were they going when they jumped the kerb (25, 45, 65 mph)?

Did they lose a hubcap when they jumped the kerb?