



Retrieval can increase or decrease suggestibility depending on how memory is tested: The importance of source complexity

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ABSTRACT

Taking an intervening test between learning episodes can enhance later source recollection. Paradoxically, testing can also increase people's susceptibility to the misinformation effect – a finding termed retrieval-enhanced suggestibility (RES, Chan, Thomas, & Bulevich, 2009). We conducted three experiments to examine this apparent contradiction. Experiment 1 extended the RES effect to a new set of materials. Experiments 2 and 3 showed that testing can produce opposite effects on memory suggestibility depending on the complexity of the source test. Specifically, retrieval facilitated source discriminations when the test contained only items with unique source origins. But when the source test included some items that had appeared in multiple sources, the intervening test actually increased source confusions. These results have implications for a wide variety of learning situations. We focused our discussion on eyewitness memory, source complexity, and reconsolidation.

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Introduction

Over 30 years ago, the seminal work by Loftus and her colleagues (e.g., Loftus & Palmer, 1974) highlighted the damaging power of misinformation on the accuracy of eyewitness memory reports. With today's round-the-clock news coverage, misinformation proliferates in the media. Therefore, investigations on how misinformation can affect people's memory are even timelier now than when the concept was originally introduced. In the present paper, we examined whether retrieval practice, or testing, can be used to reduce people's susceptibility to the misinformation effect.

According to the source monitoring framework (Johnson, Hashtroudi, & Lindsay, 1993), manipulations that enhance source memory should reduce the influence of misinformation (Lindsay, 1990). Testing is one such manipulation. The testing effect is one of the most well documented empirical phenomena in cognitive psychology

over the past decade (Rawson & Dunlosky, 2011), and its benefits extend well beyond strengthening memory of the retrieved items. In multi-list learning experiments, testing has repeatedly been found to augment later source retrieval. For example, testing can facilitate recollection of contextual information (Brewer, Marsh, Meeks, Clark-Foos, & Hicks, 2010; Chan & McDermott, 2007; Verde, 2004) and can insulate against the buildup of proactive interference (Jang & Huber, 2008; Pastotter, Schicker, Niedernhuber, & Bauml, 2011; Robbins & Irvin, 1976; Szpunar, McDermott, & Roediger, 2008). Pastotter et al. proposed that testing promotes temporal (or list) segregation because performing retrieval between study cycles produces internal context change. If testing enhances source discrimination, then it should reduce eyewitness suggestibility. Paradoxically, some recent papers have reported the opposite. That is, taking a memory test of the witnessed event actually increases people's suggestibility to subsequently presented misinformation – a finding termed retrieval-enhanced suggestibility or RES (e.g., Chan et al., 2009). Briefly, participants in these experiments first view an event and then either take an initial memory test (without any misleading suggestions) or perform some distractor task. After a

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retention interval, participants listen to an audio narrative that contains both correct and misleading information, and then they complete a final test. The critical finding is that initial retrieval increases recall and recognition of the misinformation. A possible explanation for RES is that initial testing potentiates learning of the misinformation (Wissman, Rawson, & Pyc, 2011), and people respond based on retrieval fluency (Benjamin, Bjork, & Schwartz, 1998) without spontaneously considering the source of retrieved information (Lindsay & Johnson, 1989). Because initial testing enhances new learning, it paradoxically increased accessibility of the misinformation.

Consistent with this retrieval fluency hypothesis, providing subjects with a (post-encoding) warning about the veracity of the misinformation narrative eliminates the RES effect (Thomas, Bulevich, & Chan, 2010). Indeed, the researchers noted that "... when provided with a warning, subjects took time to evaluate the source of the retrieved information, and this effortful process led to increased accuracy" (p. 156). Although this is a reasonable conclusion, one cannot be certain that the warning actually increased the likelihood of deliberate source monitoring because Thomas et al. never tested source memory. Furthermore, it is difficult to pinpoint the mechanisms underlying the effects of warning. Aside from more careful source monitoring, warning can reduce the misinformation effect by tightening participants' response criterion (Echterhoff, Groll, & Hirst, 2007). Alternatively, a warning can increase recognition of the original detail as long as participants can reject the misinformation, and this can occur even if participants had failed to encode the original detail (for a thorough discussion, see McCloskey & Zaragoza, 1985). Moreover, participants may interpret a warning as permission to forget the narrative, consequently reducing accessibility of the misinformation (MacLeod, 1998). Because of the ambiguity inherent in a warning manipulation, the processes by which a warning eliminates the RES effect remain unknown. In the present research, we tested source memory directly.

The present experiments

Three experiments were conducted to examine the relation between testing and source monitoring in the context of eyewitness memory. Specifically, we propose that the effects of testing on subsequent witness suggestibility can be **positive** or **negative** depending on retrieval conditions. It is possible that testing would reduce suggestibility only when participants are required to make deliberate source judgments during retrieval, but testing would exacerbate suggestibility if participants instead respond based on fluency. In addition, we attempted to extend the generalizability of the RES phenomenon. To date, the same critical event was used in all existing investigations that reported RES (e.g., Chan et al., 2009; Thomas et al., 2010). Notably, the witnessed event in previous studies was a ~40 min video depicting a terror attack with multiple subplots (e.g., a family gathering, the rebellious behavior of a teenager, a presidential election, and a terrorist attack that involved a plane explosion). Arguably, such a complex event is not representative of the shorter events

experienced by many eyewitnesses. In the current study, we used a much shorter (~8 min) video event. In addition, this video followed the actions of a single protagonist who stole a diamond from a heavily guarded museum. Indeed, other than the fact that they both included a crime, there was very little in common between the video used in previous RES studies and the present one. This new set of materials helps to extend the generalizability of RES from a long, complex event to a short, simpler event.

All experiments had the same design. First, participants watched a video that depicted a museum burglary. They then either took an immediate cued recall test of the video (i.e., the **test condition**) or completed a distractor task (i.e., the **no-test condition**). Following a retention interval, all participants listened to a narrative containing primarily correct information in addition to six pieces of misinformation. After an additional retention interval, participants took the final test, which was cued recall for Experiment 1 and source recognition for Experiments 2 and 3.

Experiment 1

Method

Participants

Eighty undergraduate students from Iowa State University participated in this experiment for research credits, with 40 participants each in the test and no-test conditions.

Materials and procedure

Participants first viewed the burglary video, which was an 8 min segment from the film "The Return of the Pink Panther." They were told to pay close attention to the video but were not informed explicitly about any memory tests. After the video, participants in the test condition were administered an 18-question cued-recall test (see the Appendix for all the questions). No misinformation was presented during the initial test. Instead, the initial test served as retrieval practice and provided an assessment for the "immediate memory" of the event. Participants had 30 s to type in an answer for each question. They were then asked to rate their confidence on a scale from 1 (not very confident) to 5 (very confident). Instead of the cued recall test, participants in the no-test condition played the videogame Tetris as a filler task.

All participants then watched a 10 min distractor video before listening to the post-event narrative via headphones. This narrative was ~6 min long and included six items of misinformation (all other information was accurate). All of the misinformation included alterations of details in the video (i.e., contradictory misinformation). For instance, one of the misinformation items involved the misrepresentation of a diamond stand that appeared in the video. Two versions of the narrative were created, which were identical with the exception of the six misinformation items (e.g., Version A: the diamond stand sits on a pedestal with a *pair of dolphins* sculpted into it; Version B: the diamond stand sits on a pedestal with a *number of cupid-like creatures* sculpted into it; Correct Answer: the

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