

False memories are not surprising: The subjective experience of an associative memory illusion

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Received 24 August 2007; revision received 30 November 2007

Available online 6 February 2008

Abstract

Four experiments examined subjective experience during retrieval in the DRM false memory paradigm [Deese, J. (1959). On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology*, 58, 17–22; Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21, 803–814]. Subjects studied lists of related words that were associated with critical non-presented words and then took a recognition test in which they made judgments about their experience of each test item. We tested the prediction from [Whittlesea, B. W. A. (2002). False memory and the discrepancy–attribution hypothesis: The prototype-familiarity illusion. *Journal of Experimental Psychology: General*, 131, 96–115] discrepancy–attribution hypothesis that subjects experience critical lures as surprising, and that the experience of surprise leads them to call the lures old. We found that subjects were not surprised when they encountered critical lures on a recognition test and, in fact, they reported that they expected to see critical lures more than they expected to see words that they had actually studied. When subjects did experience words as surprising, they called the words new, not old. The results support the idea that false memories in the DRM paradigm occur when critical lures are activated in memory and fluently processed on a test, leading subjects to experience critical lures in much the same way that they experience words they actually studied. The results do not support the idea that false memories are surprising, as stated by the discrepancy–attribution hypothesis.

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Keywords: False memory; Subjective experience; Metamemory; Surprise

One remarkable aspect of false memories is the compelling subjective experience that often accompanies them. For example, in Loftus's misinformation paradigm (Loftus, Miller, & Burns, 1978), when subjects witness an event and then read a narrative that contains

misinformation, they falsely remember the misinformation on a later memory test (Roediger, Jacoby, & McDermott, 1996), they attribute the misinformation to the actual event even when told that the narrative contained no true information (Lindsay, 1990), and they are willing to bet money on their false memories (Weingardt, Toland, & Loftus, 1994). In studies of imagination inflation, when subjects repeatedly imagine an event, on a later memory test they will sometimes report

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that the imagined event actually occurred, even though it did not, and moreover will claim that they consciously remember experiencing the occurrence of the imagined event (Goff & Roediger, 1998). False memories also occur in laboratory tasks with relatively impoverished materials like word lists. When subjects study lists of related words that are associated with a critical non-presented word, they will falsely recall and falsely recognize the critical word at very high levels, and when asked to judge their subjective experience, they claim that they consciously remember experiencing the word when it was presented (Deese, 1959; Roediger & McDermott, 1995; see Gallo, 2006, for review). All of these examples suggest that subjects often experience false memories in much the same way that they experience true memories, and that the compelling subjective experience associated with memory illusions is partly responsible for leading people to mistakenly label their illusory recollections as memories.

One current theory suggests that two sets of processes are involved in the arousal of false memories: Illusory recollections occur when related concepts are activated in memory (Anderson, 1983; Collins & Loftus, 1975), and when monitoring processes that guide decisions about what to call a memory fail to distinguish between events that actually occurred in the past and events that did not occur but were activated in memory (Johnson, Hashtroudi, & Lindsay, 1993). This theory is known as the activation/monitoring framework (Roediger, Balota, & Watson, 2001; Roediger, Watson, McDermott, & Gallo, 2001), similar in many ways to Johnson et al.'s source monitoring framework. The activation/monitoring framework proposes that when subjects study lists of related words that are associated with a non-presented critical word, activation spreads throughout semantic associative networks from the studied words to the critical word, thereby partially activating the critical word. When memory for the words is assessed, failures in the ability to monitor the source of activation during retrieval lead subjects to make the mistaken claim that non-presented critical words were originally studied.

There is considerable support for the activation/monitoring account of false memories in the DRM paradigm (see Roediger et al., 2001; Gallo, 2006). For example, backward associative strength, the degree to which list items tend to evoke the critical item in association norms, is the strongest predictor of false recall (Deese, 1959; Gallo & Roediger, 2002; Roediger et al., 2001). Just as studying semantically related words produces false memories for non-presented semantic associates, studying phonologically related words derived from the same lexical neighborhood (Luce & Pisoni, 1998) also leads to false recall and false recognition of non-presented phonological associates (Sommers & Huff, 2003; Sommers & Lewis, 1999). Further, lists that con-

tain both phonological and semantic associates produce superadditive effects on false recall (Watson, Balota, & Roediger, 2003). Finally, older adults and other populations with deficits in memory monitoring abilities at retrieval show heightened levels of false recall and false recognition (Balota, Cortese, Duchek, Adams, & Roediger, 1999; McCabe & Smith, 2002; Norman & Schacter, 1997). This brief review represents only a small portion of the evidence in favor of the activation/monitoring framework (see Gallo, 2006; for a detailed review), although of course other theories of these phenomena have been developed. The evidence suggests that, in the DRM paradigm, the critical non-presented word becomes activated in memory, and on a test, subjects are unable to distinguish well between non-presented critical words and words that they actually studied. The subjective experiences of critical words and list words seem largely isomorphic.

Another theory explaining illusory recollections is Jacoby's attributional theory (Jacoby, Kelley, & Dywan, 1989), which also holds that subjective experience plays a critical role in guiding people's decisions about what to call a memory, sometimes leading to false memories. The attributional view of memory proposes that people use a fluency heuristic when deciding whether an event is a memory, attributing the fluency of their current processing to indicate that they had experienced an event previously (Jacoby & Dallas, 1981). However, if processing fluency is enhanced by some other means, it may be mistakenly attributed to prior experience. For example, Jacoby and Whitehouse (1989) primed some words in a recognition memory test by briefly flashing the word immediately before it was shown on the test. Priming the words on the test enhanced the fluency of processing those words, leading to increased false alarm rates to non-studied words. (Rajaram, 1993; also showed that this manipulation enhances "know" judgments, in the procedure in which subjects are asked to judge whether they remember or know that they had studied a word). The effects of processing fluency are also observed in other paradigms. Jacoby, Woloshyn, & Kelley (1989) showed that when subjects were asked to judge whether a name was famous, they were more likely to mistakenly judge a non-famous name to be famous when the name had been repeated from an earlier session, because subjects attributed their fluent processing of the repeated name to indicate that the name was famous. Similarly, Jacoby, Allan, Collins, and Larwill (1988) had subjects judge the loudness of a background noise in which words were presented. When words were repeated from an earlier experience, subjects judged the noise to be less loud, even though the objective noise level was the same. Fluent processing of repeated words led subjects to indicate that the noise level was less loud. Just as the activation/monitoring view holds that individuals experience illusory recollections in much the same way as they expe-

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