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# The roles of associative responses at study and semantically guided recollection at test in false memory: the Kirkpatrick and Deese hypotheses

Steven M. Smith,\* David R. Gerken, Benton H. Pierce, and Hyun Choi

*Department of Psychology, Texas A&M University, College Station, TX 77843-4235, USA*

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## Abstract

False recall is found for semantically related words that are not presented on both categorized and associatively structured study lists. Four experiments provide evidence that the associative list method produces false memories because of semantic processes involved in studying list words (the Kirkpatrick hypothesis), but that false memories produced by categorized lists occur because of the use of semantic knowledge at test (the Deese hypothesis). In a free association task, words from associative lists, but not categorized lists, tended to evoke critical words as responses, indicating that our categorized list words have low associative strength to critical nonpresented items. Studying those associative lists, but not the categorized ones, produced indirect priming effects in stem completion. Critical nonpresented words from categorized lists showed a priming effect only when participants were instructed at test to try to complete stems with studied list words (i.e., stem cued-recall). The results highlight important differences between categorized and associative list methods, and indicate that false memories can be caused by semantic processes that occur at the time of a memory test. © 2002 Elsevier Science (USA). All rights reserved.

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## False recall and stem completion: evidence of semantically guided recollection

People often misremember events, sometimes incorrectly claiming to recall or recognize non-presented words that are semantically related to studied items. For example, false recall and recognition of specifically targeted nonpresented words have been demonstrated frequently when participants study and recall lists constructed

from words that are all associated with a single nonpresented critical word (e.g., Deese, 1959; Read, 1996; Roediger III & McDermott, 1995). Such lists, sometimes called DRM lists (named for popularly cited works by Deese, and by Roediger & McDermott), are often designed such that list words have high associative strength to critical nonpresented words, and will be referred to herein as *associatively structured lists*, or simply *associative lists*. A similar false recall effect occurs for categorized lists of words that omit highly typical or dominant category members (e.g., Smith, Gilliland, Gerken, Pierce, & Tindell, 1998, 2000, 2001). That is, when highly dominant category

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\* Corresponding author.

*E-mail address:* sms@psyc.tamu.edu (S.M. Smith).

members (e.g., *chair* for the category *furniture*, *orange* for *fruit*) are left off of presented lists of common category members, the common nonpresented words are often falsely recalled. These false memories have been termed *semantic confusion errors* by Smith et al. (2001); such intrusions and false alarms are made because critical items are semantically related to the materials that were actually studied.

In the present study we focus on the question of when, in the course of learning and remembering, semantically influenced false memories occur. Are such semantic confusion errors caused by processes that occur as a function of studying word lists, processes that occur when materials are tested and remembered, or both?

In an early description of false memory effects, Kirkpatrick (1894) discussed the effects of semantically related material on false memories:

There were some incidental illustrations of false recognition. About a week previously in experimenting upon mental imagery I had pronounced to the normal students ten common words. Many of these were recalled and placed with the memory list. Again, it appears that when 'spool,' 'thimble,' 'knife,' were pronounced, many students at once thought of 'thread,' 'needle,' 'fork,' which are so frequently associated with them. The result was that many gave those words as belonging to the list (Kirkpatrick, 1894, p. 608).

Kirkpatrick considered the effect of semantic confusion on false memory to be a study phenomenon, attributing the errors to the time when the list of words was first pronounced. Thus, the Kirkpatrick hypothesis states that false memories occur because of processes that take place when words are studied.

Some 65 years later, Deese (1959) found similar false memory effects using associatively structured lists, constructed such that each word on a list was closely associated with a single nonpresented linking word. For example, a list might contain the words "dream," "pillow," "nap," and "bed," in addition to other words that are strongly associated with the critical nonpresented linking word, "sleep." In contrast to Kirkpatrick's account, Deese described the effects of associated words as occurring at the time of the memory test, stating that, "in the process of recollection, words and concepts associated with remembered items will be added" (p. 21). The Deese hypothesis indicates that recall or recognition of some of the list words at test activates associations to the

critical nonpresented word, thereby leading to false memory of the nonpresented words.<sup>1</sup> In the present study, we extend the Deese hypothesis to include effects at test of any type of semantic knowledge, including not only associations, but category knowledge and conceptual information, as well.

The preponderance of false memory research with associatively structured lists supports the Kirkpatrick hypothesis. Experiments that manipulate variables at study often find effects of those study factors on false recall and recognition. For example, some studies have reported effects of the level of processing of associative list words at study on subsequent false memory (e.g., Rhodes & Anastasi, 2000; Thapar & McDermott, 2001; Toggia, Neuschatz, & Goodwin, 1999). Likewise, whether associative lists are presented in a blocked vs. random order at study affects false memory (e.g., Mather, Henkel, & Johnson, 1997; McDermott, 1996).

Indirect priming effects found by McDermott (1997) and McKone and Murphy (2000) are also more consistent with Kirkpatrick's (1894) hypothesis, supporting the notion that associative responses during study cause false memories. McDermott (1997) and McKone and Murphy (2000) found that nonpresented words from associatively structured lists were indirectly primed, as measured by a stem completion test. In those experiments few or no relevant associates to the critical nonpresented words were presented on the stem completion test, so associative responses leading to the critical word at test were unlikely to

<sup>1</sup> By contrasting these two hypotheses, we are not implying that they are mutually exclusive; we merely wish to give credit to those who first proposed the two hypotheses. As far as we know, neither Kirkpatrick nor Deese contradicted the alternative hypotheses, nor did they suggest that encoding and retrieval processes could not interact to produce the false memory effects they found. We have interpreted Deese's statement, "in the process of recollection, words and concepts associated with remembered items will be added," to mean that false memories can be due to processes that occur during testing, while participants are remembering word lists. Of course, Deese's main point was that the probability of producing an intrusion is "proportional to the average association strength of that item in the context of the material being recalled (p. 21)." Deese's ideas about association strength could be used to explain false memory effects that are due to processes that occur during initial study as well as during the test.

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