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Decoupling semantic and associative information in false memories: Explorations with semantically ambiguous and unambiguous critical lures☆

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Abstract

Veridical and false memory were examined in lists that contained 12 words that all converged onto the same meaning of a critical nonpresented word (e.g., snooze, wake, bedroom, slumber. . . , for SLEEP) or lists that contained 6 words that converged onto one meaning and 6 words that converged onto a different meaning of a homograph (e.g., stumble, season, trip, autumn. . . , for FALL). Associative strength from the list items to the critical item was equated across the two types of lists. In Experiments 1–5, patterns of veridical memory differed across the two types of lists; however, false memory of the critical item did not differ. This same pattern occurred regardless of whether the words diverging onto the two meanings of the homograph were presented blocked or intermixed, whether each list item was presented for 80 ms, 200 or 1200 ms during encoding, and whether a recall or recognition test was given. In Experiment 6, critical nonpresented items that followed lists converging onto one meaning were judged as more strongly related to the list. These results suggest that false memory in the DRM paradigm largely reflects lexical/associative activation, rather than the formation of a meaningful thematic representation.
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Aristotle speculated that humans organize the world into a coherent mental representation through the formation of links between related experiences. In particular, his laws of association governed that such links are likely to be formed between concepts that are similar, opposites, or follow one another closely in time. More recently, cognitive psychologists have attempted to formalize a mechanism through which such extensive associative networks could (1) represent a vast amount of world knowledge and (2) access such knowledge to answer general knowledge questions, predict upcoming events, and make inferences during comprehension

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(Anderson, 1983; Collins & Loftus, 1975; Kintsch, 1974; Ratcliff & McKoon, 1978).

The most common procedure for investigating the organization of such networks of related information is the *semantic priming* paradigm (Anderson, 1983). Using this paradigm, researchers have discovered that responding to a target word such as "cat" is faster (in naming and lexical decision tasks) following a semantically related prime (e.g., dog) than following an unrelated prime (e.g., table). Because relatedness exerts an influence in these simple tasks, some researchers have suggested that semantic priming reflects an *automatic spreading activation* mechanism in which, while reading or hearing a word, activation automatically spreads from the semantic representation (node) of that word to the representations (nodes) of semantically associated neighbors (Neely, 1977; Posner & Snyder, 1975).

Demonstrations of semantic relatedness have also been obtained using episodic memory tasks. For instance, Underwood (1965) noticed that the presence of a word such as "table" in a study list increased people's likelihood of falsely recognizing a related word such as "chair" during a later recognition test, relative to an unrelated word such as "screen." In a more powerful procedure, known as the Deese–Roediger–McDermott (DRM) false memory paradigm (after Deese, 1959; Roediger & McDermott, 1995), participants see or hear lists that include the first 15 associates for a given target word and are then given a recall or recognition test. The robust finding from these studies is that the nonpresented target word is falsely remembered at very high levels (see Gallo & Roediger, 2002; Roediger, Balota, & Watson, 2001; Roediger & Gallo, 2003; for recent reviews). In fact, in some circumstances, these words are recalled or recognized as often (Roediger & McDermott, 1995) or even more often (Brainerd & Reyna, 1998; McDermott, 1996; Watson, Balota, & Roediger III, 2003) than items actually presented.

The question of meaning

For both semantic priming and false memory paradigms, one fundamental question has centered on whether the effect reflects lexical associative activation from the prime (or studied items) to the target (or critical nonpresented item) or is due to the extraction of meaning from the prime which then facilitates the processing of the target. The difficulty in answering this question stems from the fact that both priming studies and false memory studies rely heavily on stimuli obtained from word association norms. A vast majority of such associated pairs contain a large overlap in semantic features (see Table 1 from Hutchison, 2003). For instance, the words "cat" and "dog" are both associated (in that they typically co-occur in language) and semantically related (in that they are part of the same PET category and share many semantic features such as "fur" and "claws"). As a result, priming effects from such items could be due to either lexical association, semantic feature overlap, or both.

We will briefly review the evidence from automatic semantic priming tasks and argue that priming may simply be due to associative activation, rather than semantic feature overlap. We will then describe a paradigm from "semantic" priming studies which affords a way to discriminate associative vs. semantic priming. Finally, we will explain how this technique can be implemented to explore the role of meaning on false memories in the DRM paradigm.

Association vs. meaning in semantic priming

Fodor (1983) proposed simple associative links between words that tend to co-occur either in experience or in language so that "co-occurrence relations among *mental* events mirror the corresponding relations among *environmental* ones" p. 33. Accordingly, reading or hearing the word "salt" will automatically activate "pepper," not because these words have similar meanings, but because they tend to co-occur together. Researchers have more recently argued that semantic priming is not due simply to spreading activation across such associative links, but rather to shared semantic features (e.g., salt and pepper are both small, both spices, both found in shakers, etc...) between primes and targets (Kawamoto, 1993; Masson, 1995; Moss, Hare, Day, & Tyler, 1994; Plaut, 1995). Recent priming publications appear to support this assumption (see Lucas, 2000; for a review).

Hutchison (2003) has recently reviewed the studies used as support for the feature overlap hypothesis and came to a different conclusion. Specifically, he argued that there was no strong evidence of automatic priming for items lacking an association (e.g., "horse-deer," see Lupker, 1984; Shelton & Martin, 1992; for similar conclusions). For example, when re-examining the stimuli used to support the importance of feature overlap to priming (e.g., de Morney Davies, 1998; Hines, Czerwinski, Sawyer, & Dwyer, 1986; Thompson-Schill, Kurtz, & Gabrieli, 1998), Hutchison found that the "semantic" items were more strongly associated than the "associative" items, according to the Nelson, McEvoy, and Schreiber (1999) word-association norms. Thus, the larger priming for "semantic" items could have just as easily reflected association strength as featural overlap. In contrast, Hutchison found strong support for automatic priming based only on association. For example, items that share little or no features (e.g., LION-STRIPES) but are associated via a "mediating" associative link (e.g., TIGER) show consistent priming effects, and such effects occur under relatively automatic priming condi-

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