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Creating false memories with hybrid lists of semantic and phonological associates: Over-additive false memories produced by converging associative networks

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Abstract

The present experiments assessed false memories for critical items (e.g., *dog*) following the presentation of semantic associates (e.g., *hound*, *puppy*), phonological associates (e.g., *log*, *dot*), or hybrid lists of semantic and phonological associates (e.g., *hound*, *dot*). Experiment 1 indicated that the addition of only three phonological associates to a list of 10 semantic associates doubled the recall of non-presented critical items. Experiment 2 indicated that embedding 18 semantic associates and 18 phonological associates within a single list led to greater false recall than the sum of the false recall effects produced by lists containing 18 semantic associates or lists containing 18 phonological associates. Experiment 3 explored this over-additivity and indicated that lists of 8 semantic associates and 8 phonological associates produced greater false recall and false recognition than the average produced in lists containing 16 semantic or 16 phonological associates. These studies provide converging evidence that lists of semantic and phonological associates produce over-additive false recall and false recognition of non-presented critical items relative to pure semantic or pure phonological lists. An activation-monitoring framework is presented that provides an account of the increased false memories elicited by hybrid lists of semantic and phonological associates. Experiment 3 also showed that the experience of remembering during recognition was driven more by semantic factors, whereas the experience of knowing was driven more by phonological factors.

Keywords: False memories; DRM paradigm; Semantic processing; Phonological processing; Source monitoring; Associative networks

There has been considerable recent interest in the nature of falsely remembering information that was never directly presented to an individual. This interest has been nurtured in part by Roediger and McDermott (1995) who adapted an experimental technique originally developed by Deese (1959), hereafter referred to as the DRM paradigm. Roediger and McDermott presented participants with lists of 15 words that were the strongest associates to a missing word or critical item in word association norms (Russell & Jenkins, 1954). For example, participants might hear the following list of words, all of which are associated to the non-presented critical item *sleep*: *bed*, *rest*, *awake*, *tired*, *dream*, *wake*, *snooze*, *blanket*, *doze*, *slumber*, *snore*, *nap*, *peace*, *yawn*, *drowsy*. Immediately following the presentation of the study list, participants recalled as many of the list words as possible in any order (i.e., free recall), and were warned against guessing. Despite this warning, participants recalled the non-presented critical items with about the same probability as items that appeared in the middle of the study list. Roediger and McDermott also found high levels of false alarms for the non-presented critical lures in recognition performance. Interestingly, when asked to make "remember–know" metamemory judgments (see Tulving, 1985),

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participants claimed to "remember" the actual occurrence of the non-presented critical lures at about the same level as words that were actually presented. These remarkably high levels of false recall and false recognition in the DRM paradigm have been widely replicated and extended (see Roediger, McDermott, & Robinson, 1998, for a partial review).

Extending the DRM paradigm: Phonological false memories

Several researchers extended the scope of the DRM paradigm by constructing lists of phonological associates that converge upon non-presented critical items (e.g., Chan, McDermott, Watson, & Gallo, 2003; McDermott & Watson, 2001; Schacter, Verfaellie, & Anes, 1997; Sommers & Lewis, 1999). For simplicity, in the present study, we use the terms "semantic" or "phonological" to describe the composition of a list of associates. However, it is important to note that semantic lists may include lexical and/or semantic associates (e.g., *lion* and *tiger*) and phonological lists may include orthographic and/or phonological associates (e.g., *log* and *dog*). The notion is that just as there are networks of semantic associates that capture the meaning of words, there are networks of orthographic associates that capture the spelling of words and networks of phonological associates that capture the pronunciation of words (e.g., Collins & Loftus, 1975; Luce & Pisoni, 1998). For example, Sommers and Lewis (1999, Experiment 1) presented lists of words for study, all of which were associated to the non-presented critical item *but*: *buff*, *put*, *bet*, *boot*, *buck*, *hut*, *bud*, *bus*, *buzz*, *bug*, *boat*, *cut*, *bat*, *bit*, *bought*. The phonological associates were generated by adding, deleting, or substituting phonemes from critical items. Consistent with the semantic false memory findings in the DRM paradigm, robust levels of false recall and false recognition have been obtained with lists of phonological associates. Sommers and Lewis reported false recall and false recognition of critical items to be .54 and .67, respectively, following auditory presentation of phonological lists. However, unlike semantic false recognition, which is characterized by a high proportion of "remember" relative to "know" responses (cf. Roediger & McDermott, 1995), early evidence suggests that phonological false recognition is characterized by a roughly equivalent proportion of "remember" and "know" responses (see Schacter et al., 1997).

Creating false memories with pure and hybrid lists of associates

In the present paper, we investigated the influence of combining both semantic and phonological associates in a single list, creating false memories with "hybrid" lists of associates (cf. Watson, Balota, & Sergent-Marshall, 2001). Although we will delay theoretical discussion until the results have been provided, a priori, it is clear that hybrid lists afford a unique opportunity to investigate the roles of different types of associative information in producing false memories. As noted, researchers have typically either looked at pure lists of semantic associates or pure lists of phonological associates, with the vast majority of studies in this area addressing the powerful effects of pure lists of semantic associates. Although semantic lists provide considerable support for the role of conceptual level representations in producing false memories, these lists provide relatively little support for the orthographic and phonological codes that typically accompany the presentation of a word. In fact, McDermott (1997) found relatively small (compared to presented items), but reliable, priming effects in a word fragment completion task for non-presented critical items. Hence, a critical source of information (the perceptual event at encoding) is relatively impoverished for the non-presented critical item in semantic lists. Consistent with this notion, Schacter, Israel, and Racine (1999) suggested that the relative distinctiveness of studied items and non-presented critical items could be used to reduce false memories in the DRM paradigm. For example, Norman and Schacter (1997) found that both young and older adults recalled more sensory information for studied items than non-presented critical items. Within a source monitoring framework, subjects could use sensory information to discriminate those items that were presented from those items that were not presented, even though there is considerable conceptual information available to support the retrieval of non-presented critical items. However, when there is strong support for both conceptual information and perceptual information as in the hybrid lists, subjects may no longer be able to use orthographic and phonological information to help make the discrimination between real and false memories.

In contrast to pure semantic lists, consider pure phonological lists. Here, there is considerable activation for surface-level, perceptual information; however, there is little support for conceptual information. Because conceptual processes are more likely to drive long-term memory performance (e.g., Craik & Lockhart, 1972), one might expect the influence of perceptual processes to be relatively short-lived. Hence, again, the intriguing possibility is that when combining the two sources of information (i.e., more perceptually driven orthographic/phonological information with more conceptually driven lexical/semantic information), one might expect increased false memories, because the missing piece of information (i.e., either perceptual codes for pure semantic lists or conceptual codes for pure