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Assessing activation without source monitoring in the DRM false memory paradigm ☆

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Abstract

Four experiments examined whether studying a single Deese/Roediger-McDermott (DRM) list produces semantic priming for nonstudied critical items (CIs) and semantic + repetition priming for studied associates. After 30 s of mental arithmetic that followed the study of a DRM list, priming was assessed in a lexical decision task when the nonwords were either pronounceable (Experiment 1) or pseudohomophones (Experiments 2–4). Priming was measured relative to a baseline containing exactly the same CIs and associates that had not been primed by their related DRM lists. Significant CI semantic priming effects occurred in all four experiments, whether or not there was within-test priming from a related associate preceding the CI by 3–7 items. To our knowledge, these are the first experiments using *standard* DRM study procedures to provide a convincing demonstration of a genuine CI semantic priming effect in a delayed indirect memory test that should be free of intentional retrieval strategies. Discussion focuses on measuring long-term semantic activation effects without the influence of source monitoring in a lexical decision task.

Keywords: Lexical decision; False memory; Priming; Implicit memory

In the Deese/Roediger-McDermott (DRM) false memory paradigm (Deese, 1959a, 1959b; Roediger & McDermott, 1995), people study a DRM list in which words (e.g., *bed*) are all *associates* of a single nonstudied *critical item* (CI, e.g., *sleep*). The probability of falsely recalling or recognizing *nonstudied* CIs as having been studied is often similar to (or sometimes higher than) the probability of correctly recalling or recognizing associates that were actually presented in the middle of the studied DRM list (e.g., Roediger & McDermott, 1995; Gallo, Roberts, & Seamon, 1997). This *false memory effect* occurs under a wide variety of conditions (see Roediger, Balota, & Watson, 2001; Roediger, McDermott, & Robinson, 1998, for reviews). Roediger et al.'s two-process *Activation/Monitoring* theory assumes that the presentation of the associate *blanket* indirectly

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activates the representations in memory corresponding to related words such as the CI *sleep* (either automatically, cf. Neely, 1977, or strategically, through *implicit associative responses, IARs*—Underwood, 1965). This indirect activation of the CI accumulates as each of its associates is studied. In the recall or recognition test, false memories occur for the highly activated CI when source monitoring fails, that is, when people misattribute the source of the indirect activation of the *nonstudied* CI to the direct activation that would have been produced if it had been studied. In short, Activation/Monitoring theory suggests that false memories are produced by the conjunction of a heightened indirect activation of *nonstudied* CIs and a failure of source monitoring.

The Activation/Monitoring theory encourages one to attempt to isolate activation effects from the influence of source monitoring.[1] One approach for doing this in the standard explicit recognition memory test is to reduce source monitoring by having a short response deadline that does not allow enough time for source monitoring to operate (e.g., Benjamin, 2001) or by testing populations with breakdowns in source monitoring (e.g., the early-stage Alzheimer's Disease patients tested in Balota et al., 1999). Another approach, which is the focus of the current research, is to use indirect memory tests that presumably do not engage source monitoring. We now turn to a review of experiments that have used this approach.

Indirect memory tests in the DRM paradigm

Indirect memory tests presumably eliminate source monitoring because people are not explicitly asked to decide if a word was studied, but instead are asked to do a task apparently unrelated to the study phase, such as completing, with the first word that comes to mind, word stems or fragments in which some of the answers are previously studied words (Graf & Schacter, 1985; Roediger & McDermott, 1993). Because people are unaware their memories are being assessed, they presumably do not attempt to intentionally retrieve the items from the prior study list or to monitor the source of the activation for these retrieved items. Thus, performance in these tests should not be influenced by source monitoring. To measure activation, a *priming effect* is computed that compares performance for test items actually presented in the study list (or nonstudied test items related to the study items) with performance on nonstudied baseline test items totally unrelated to the study items (e.g., McDermott, 1997). When the item in the indirect memory test has actually been studied, one is measuring semantic plus repetition (SEM + REP) priming because the test item is semantically related to the other studied associates and is also a repetition of an item that itself was studied. (This SEM + REP priming effect differs from the *pure* repetition priming effect measured for a word studied in a study list that does not contain other semantically related items.) By similar reasoning, for a test item, typically the CI, that was itself not studied but is related to the studied DRM items, one is measuring semantic (SEM) priming.[2] In both cases, priming is said to have occurred if the probability (or speed) of responding with a CI or associate is higher (or faster) when its related DRM list was studied compared to when it was not.

Word-production tasks as indirect memory tests for assessing activation from DRM lists

To our knowledge, seven published reports have used word-production tasks in indirect memory tests to measure activation from intentionally studied DRM lists without the influence of source monitoring. Word production was cued by either (a) a semantic cue [e.g., *drowsy* as a cue for *sleep* in a word association test (McDermott, 1997)], (b) an orthographic cue [e.g., *sl*___, *s_e_* _ or the anagram *eslpe* as a cue for *sleep* (Hicks & Starns, 2005; Løvdén & Johansson, 2003; McDermott, 1997; McKone & Murphy, 2000; Smith, Gerkens, Pierce, & Choi, 2002)], or (c) a briefly presented (50 ms) backward-masked presentation of the word itself as a cue (e.g., the perceptual identification tests in Cleary & Greene, 2004; Hicks & Starns, 2005). To perform these tasks, people presumably generate possible candidate words to each cue and then select one that is an appropriate response. The studies using word-production tasks focused primarily on CI SEM priming (which presumably can serve as a measure of the activation underlying false alarms for nonstudied CIs in direct memory tests) and associate SEM + REP priming (which presumably can serve as a measure of the activation underlying hits for studied associate in direct memory tests). In these investigations, perceptual identification tests consistently yielded only SEM + REP

[1] Another important theory of the false memory effect is Brainerd and Reyna's (2001) Fuzzy Trace Theory. This theory suggests that when a word is studied, its verbatim trace (based on its surface features) and a gist trace (based on its meaning) are independently encoded. Thus, when a CI is not studied, only its gist trace, induced from its associates, is stored. False memories emerge when the gist trace of the nonstudied CI is retrieved and then misattributed to its having been created by the actual study of the CI. Hence, if one conceives of indirect activation leading to the formation of a gist trace, the data we discuss in this paper have similar implications for Fuzzy Trace Theory and Activation/Monitoring Theory.

[2] The authors whose works are discussed in this paper did not use the labels SEM priming and SEM + REP priming for their priming effects.