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Using story contexts to bias children's true and false memories

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ABSTRACT

The effects of embedding standard Deese/Roediger–McDermott (DRM) lists into stories whose context biased interpretation either toward or away from the overall themes of the DRM lists on both true and false recognition were investigated with 7- and 11-year-olds. These biased story contexts were compared with the same children's susceptibility to false memory illusions using the standard DRM list presentation paradigm. The results showed the usual age effects for true and false memories in the standard DRM list paradigm, where 11-year-olds exhibited higher rates of both true and false recognition compared with the 7-year-olds. Importantly, when DRM lists were embedded in stories, these age effects disappeared for true recognition. For false recognition, although developmental differences were attenuated, older children were still more susceptible to false memory illusions than younger children. These findings are discussed in terms of current theories of children's false memories as well as the role of themes and elaboration in children's memory development.

Introduction

The Deese/Roediger–McDermott (DRM) paradigm (Deese, 1959; Roediger & McDermott, 1995) is perhaps the most robust procedure used to investigate the development of children's spontaneous (as opposed to implanted or suggested) false memories (for a review, see Brainerd, Reyna, & Ceci, 2008). Here, participants are presented with a list of words (e.g., *sour, candy, sugar, bitter*) that are all associates of an unpresented but related concept, the critical lure (e.g., *sweet*). Recall and recognition

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tests reveal that participants frequently mistakenly identify the critical lure as having been present on the previously studied list. More important, developmentally, younger children are less susceptible than older children and adults to spontaneous false memory illusions (Brainerd et al., 2008).

There are two main explanations concerning the development of false memories in children. First, fuzzy trace theory (Brainerd et al., 2008) suggests that there are two qualitatively different memory traces that are formed in parallel: a verbatim trace that preserves surface details of studied material and a gist trace that preserves the meaning of the information that was studied. The retrieval of verbatim traces typically results in the correct recognition and recall of targets and the dismissal of semantically related critical lures. However, because these traces fade fairly rapidly, later tests of recall and recognition may rely more on gist traces that are more likely to produce meaning-related errors such as false memory illusions. Thus, according to fuzzy trace theory, a reliance on gist traces at retrieval can increase false memory rates and decrease true memory rates, whereas a reliance on verbatim traces can increase true memory rates and reduce false memory rates. More specifically, false memories can occur through one of two retrieval processes: similarity judgments between a gist trace and a possible memory candidate or phantom recollection in which strong gist traces permit memory reconstruction that includes related but unpresented items. Fuzzy trace theory predicts false recognition reversals because these two retrieval processes can give rise to both accurate and inaccurate memories. That is, under conditions of gist cuing, there should be a monotonic increase in both true and false memories, whereas under verbatim cuing, there should be a negative relationship between true and false memories. Developmentally, fuzzy trace theory contends that the DRM illusion is less robust in young children because their ability to extract and encode the global gist (theme) of a DRM list is relatively immature. As children develop, their ability to extract gist improves and, thus, they become more susceptible to these spontaneous false memory illusions (Brainerd et al., 2008).

An alternative theoretical account of false memory development is the associative activation theory (Howe, 2005; Howe, Wimmer, & Blease, 2009; Howe, Wimmer, Gagnon, & Plumpton, 2009). This theory stipulates that associative activation of concepts in one's knowledge base is responsible for false memories in children and adults. The knowledge base consists of networks of interrelated concepts whose organization changes with development and experience. There are strong links between concepts that are highly related and weak or absent links between concepts that are less related (Gallo, 2006). When a specific concept or word is encountered, its corresponding memory representation is activated, activation that can spread to surrounding related representations in the knowledge base, including theme nodes that are related to the subset of concepts being activated (see also Arndt & Reder, 2003). These theme nodes exist like other nodes in the network, and individual concepts can be linked to multiple themes (see Fig. 1). When DRM or associative lists are studied, a number of different themes are activated, and each of these themes can give rise to false recollection. Of course, lists evoking fewer themes give rise to false memories more easily than lists with more potential themes because each list member provides activation for a smaller set of potential themes (see Fig. 1 for an illustration). Recall that because these lists are associative and there can be many potential integrating themes (e.g., relations can be varied and include temporal contiguity, spatial proximity, feature overlap, shared perceptual properties, category membership, antonymy, and synonymy [see Wu & Barsalou, 2009]), lists with fewer themes stand a greater chance of activating a single theme more quickly, and this theme's overall activation may be greater than that of lists with more themes (also see Arndt & Reder, 2003; Reder, Park, & Kieffaber, 2009). Such activation, not just backward associative strength, can increase false memory rates.

The use of theme nodes brings associative activation theory and fuzzy trace theory into greater alignment. Some might argue that the introduction of theme nodes into what has been viewed as "simple" word association models is ad hoc and borrows heavily from fuzzy trace theory's historically preeminent gist mechanism. However, a quick glance at the historical roots of associative memory models will prove this thinking wrong for at least two reasons. First, associative memory models have been around for centuries (e.g., Hamilton, 1859; Stewart, 1813; for a recent review, see Danziger, 2008), with 20th-century versions including assumptions about spreading activation in memory networks that flexibly represent multiple layers of meaning (Anderson, 1976, 1983, 1993; Anderson & Bower, 1973; Collins & Loftus, 1975). Second, because concepts can contain multiple meanings, depending on the context in which they occur, associative models have long acknowledged the