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Brief Report

Priming children's and adults' analogical problem solutions with true and false memories

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ABSTRACT

We investigated priming of analogical problem solutions with true and false memories. Children and adults were asked to solve nine verbal proportional analogies, three of which had been primed by Deese–Roediger–McDermott (DRM) lists where the critical lure (and problem solution) was presented as the initial word in the list (true memory priming), three of which were primed by DRM lists whose critical lures were the solution to the verbal proportional analogies (false memory priming), and three of which were unprimed. We controlled for age differences in solution rates (knowledge base) in order to examine developmental differences in speed of processing. As anticipated, the results showed that adults completed the problems significantly faster than children. Furthermore, both children and adults solved problems primed with false memories significantly faster than either those primed with true memories or unprimed problems. For both age groups, there was no significant difference between solution times for unprimed and true primed problems. These findings demonstrate that (a) priming of problem solutions extends to verbal proportional analogies, (b) false memories are more effective at priming problem solutions than true memories, and (c) there are clear positive consequences to the production of false memories.

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Introduction

That the human memory system is fallible is without question (e.g., see Howe, 2011a; Schacter, Guerin, & St. Jacques, 2011). Although a number of paradigms have established that memory is a powerful yet reconstructive system that is prone to error, it is perhaps the Deese–Roediger–McDermott (DRM) paradigm that has provided us with the quintessential evidence for this in terms of spontaneous false memory illusions (Deese, 1959; Roediger & McDermott, 1995). In this paradigm, participants are presented with associated words (e.g., *snooze*, *doze*, *wake*, *rest*) that are all semantic associates of an unpresented critical lure (e.g., *sleep*). When subsequently asked to remember the words on the list, both children and (to a greater extent) adults frequently remember many of the presented words along with the unpresented critical lure. Thus, like true memories, false memory production also increases with age (see Brainerd & Reyna, 2012; Howe, 2011b).

Typically, false memories are viewed as a negative consequence of our reconstructive memory system, a type of memory that might lead to miscarriages of justice (Loftus, 2003). However, recent research has demonstrated that the production of false memories need not always have negative implications (see Howe, 2011a; Newman & Lindsay, 2009; Schacter et al., 2011). For example, research has demonstrated that false memories (i.e., DRM critical lures) are capable of priming performance on implicit memory tasks such as word stem completions (McDermott, 1997; McKone & Murphy, 2000) or anagrams (Lövdén & Johansson, 2003).

Extending these findings, Howe, Garner, Dewhurst, and Ball (2010) demonstrated that false memories also prime solutions to more complex tasks, namely, insight-based problem-solving tasks. Using the compound remote associate task (CRAT) initially developed by Mednick (1962), participants were required to generate a single word that linked three presented words (e.g., *board*/*mail*/*magic* where the linking solution word is *black*). Howe and colleagues (2010) demonstrated that adult participants solved more CRATs more quickly when primed with a false memory than when no prime was presented. This finding has been replicated and extended to include priming in children (Howe, Garner, Charlesworth, & Knott, 2011).

Like the generation of spontaneous false memories in the DRM paradigm, solving CRAT problems is believed to involve a process of spreading activation, a link shared with the associative activation account of false memories (Howe, Wimmer, Gagnon, & Plumpton, 2009; Howe, Garner, et al., 2010; Howe et al., 2011). If both CRAT problems and false memories use the same spreading activation mechanism, then it seems as if CRAT problems provide an ideal platform from which to demonstrate priming effects with false memories (Howe, Garner, et al., 2010). However, despite these novel findings, one could argue that the priming of CRAT problems within this paradigm is not necessarily the priming of complex problem solving per se but rather simply the priming of more distant word associations.

The aim of the current research was to establish whether priming with false memories could also be applied to more complex reasoning tasks that go beyond "simple" word associations. To this end, we selected verbal proportional analogies of the type "*a* is to *b* as *c* is to *d*" (e.g., "grass is to green as banana is to yellow"). In analogical reasoning tasks, participants are usually presented with "*a* is to *b* as *c* is to ?" and are expected to generate the *d* term. These types of analogies are frequently used in intelligence tests (Sternberg, 1977) and academic examinations such as the statutory assessment test. Several permutations of this basic proportional analogy exist, including pictorial analogies (Goswami & Brown, 1990) as well as multiple-choice versions that rely on participants' discriminating the correct *d* term rather than generating it themselves. According to Green, Fugelsang, and Dunbar (2006), analogical reasoning problems are solved by mapping the relationship between the *a* and *b* terms onto the *c* term in order to generate the answer, *d*.

The exact processes that underlie children's and adults' analogical problem solving are believed to change with development (e.g., Ball, Hoyle, & Towse, 2010; Goswami, 1991, 1992, 2001; Sternberg & Nigro, 1980). Whereas it is believed that children solve proportional analogies by a process of semantic association (much like the spreading activation processes thought to underlie CRAT solutions; see Sternberg & Nigro, 1980), adults are believed to employ processes of analogical reasoning where the link between *a* and *b* is placed onto the *c* term to generate *d*. Although it is well known that it is