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Original Article

The positive ramifications of false memories using a perceptual closure task☆

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ABSTRACT

The negative features of false memories are frequently at the foreground of false memory research. However, it has become increasingly apparent that false memories also have positive consequences. In two experiments, we examined the positive consequences of false memories. Participants were visually presented with false memory word lists and received a recognition task. In a modified perceptual closure test, participants received degraded visual representations of words (false, true, and unrelated items) that became clearer over time. Participants had to identify them as fast as possible. Identifications based on false memories were significantly faster than those based on true memories and (un)related items. A roughly similar pattern was observed when no recognition task was used and when critical lures were replaced with other items (Experiment 2). Our results indicate that false memories can be beneficial for problem-solving tasks and counter the standard perspective that false memories are inherently negative in nature.

The imperfections of memory have often served as the cornerstone of current experimental memory research (Loftus, 2005). What most of this research shows is that our memory is prone to the formation of illusions or so-called false memories. The reason that false memories have received so much empirical attention is because of their foreboding reputation in the legal arena. That is, false memories of traumatic events (e.g., sexual abuse) have resulted in legal proceedings in which innocent people were brought to trial (Garven, Wood, Malpass, & Shaw, 1998). The principal purpose of the current experiment was to examine whether false memories can have salutary consequences as well. To address this issue, we made use of a task linked to intelligence (i.e., picture completion).

Although mainstream false memory research has contributed much to the debate on the negative effects of false memories (Otgaar, Sauerland, & Petrila, 2013), less scientific knowledge is available on whether false memories are also positive and adaptive. To examine this hypothesis, some researchers have investigated the link between false memories and priming performance on related memory tasks. In a typical false memory priming experiment, participants are presented with lists of semantic associates (i.e., DRM lists; Deese, 1959; Roediger & McDermott, 1995). After the presentation of the lists, participants receive tasks that tap into implicit memory (e.g., stem completion). The basic result is that the presentation of lists of associates primes the non-presented theme word (i.e., critical lure) on implicit memory tasks and that, therefore, participants completing such tasks report the critical lure (Diliberto-Macaluso, 2005; McDermott, 1997; McKone & Murphy, 2000).

Perhaps somewhat more germane is work that has looked at false memory production and subsequent performance on non-memory, problem-solving tasks. For example, Howe, Garner, Dewhurst, and Ball (2010) presented adults with lists of associatively-related words (e.g., web, insect, bug, fly; DRM lists) known to elicit false memories (i.e., spider). Following presentation of these lists, participants were given a memory test and then had to solve compound remote associate task (CRAT) problems. Here, three words are provided to participants (e.g., widow, bite, house) and they must come up with a single word (in this case, spider) that when combined with each of the first three, provides

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meaningful phrases. Importantly, the non-presented critical lures of the DRM lists served as the solution to some of these CRATS. The chief finding was that when participants falsely recalled critical lures, CRAT problems were solved more frequently and significantly faster than when problems were not primed by DRM lists. These findings have been replicated with children (Howe, Garner, Charlesworth, & Knott, 2011) and extended to proportional analogies (Howe, Threadgold, Norbury, Garner, & Ball, 2013). Finally, Howe, Garner, and Patel (2013) showed that survival-related false memories serve as better primes for solving problem-solving tasks than neutral false memories.

In the current study, we were interested in whether false memories might have positive ramifications in another unique domain. That is, one limitation of using CRATs is that although they are non-memory-based problem tasks, they still resemble the procedure of a standard DRM procedure. Specifically, in a CRAT, participants also receive words that are related to a non-presented word just as in the DRM procedure. So, our purpose was to examine whether the salutary effects of false memories can also be demonstrated in problems linked to intelligence (e.g., picture completion). To be more specific, we examined whether false memories could prime solutions on an adapted perceptual closure task thereby mirroring a picture completion task. Second, like Howe, Garner, et al. (2013), our interest was whether this effect would differ when the emotional aspect of the lists was varied. Using this methodology, our study has the potential to deliver novel insight into the adaptive nature of memory illusions and the robustness of earlier findings herein.

Examining false memory priming effects in the realm of intelligence is interesting because intelligence has been considered to be essential for survival (Kanazawa, 2012; Roth & Dicke, 2005). Intelligence can be broadly defined as the speed at which species solve problems in their environment. It is obvious from this definition that examining the positive effects of false memories can be fruitful when relating it to intelligence. If one were to find positive consequences of false memories on tasks linked to intelligence, it would generalize the finding that false memories can have positive effects in a substantial manner. Our intent was to examine this question by using a perceptual closure task (Snodgrass & Kinjo, 1998). Perceptual closure refers to the process where a person fills in missing parts of a degraded stimulus in order to complete an image and create a clear object. In a perceptual closure task, participants are presented with degraded stimuli that become less degraded over time. Participants are asked to indicate as soon as possible what the stimuli represent. Of significance for the current experiment is that this task parallels subtasks in certain intelligence tasks (e.g., Luteijn & Barelds, 2004). That is, in certain intelligence subtests (i.e., picture completion), participants have to identify degraded pictures as fast as possible. In our experiment, we made use of this idea and developed an adapted perceptual closure task. Participants were presented with DRM lists and received a recognition task. After the recognition task, participants were shown degraded non-presented and presented words. Their instruction was to indicate if they recognized the word and state which word it entailed. Our expectation was that false memories would result in equally fast or even faster solution rates relative to true memories (Howe, Garner, et al., 2013).

Furthermore, in the present methodology, we included both neutral and negative DRM lists. Negatively-charged material is often more susceptible to false memory creation than more mundane material (Otgaar, Candel, & Merckelbach, 2008) and, hence, one could expect that false memory priming effects are larger for negatively-laden material. However, one could also anticipate that negative false memories are not better primes on a perceptual closure task than neutral false memories. That is, research shows that affective information can lead to a reduction in false memories, which might lead to smaller priming effects (e.g., Storbeck & Clore, 2005). According to this scenario, a reduction in negative false memories might make them less available to be used during the perceptual closure task, thereby leading to slower solution rates.

1. Experiment 1

1.1. Method

1.1.1. Participants

A total of 43 adult participants (M_{age} = 20.50, SD = 1.60; range: 18–27 years; six male) were involved in the current experiment. Students were awarded course credits or a financial compensation for their participation (€7.50). As a requirement, participants were not allowed to have participated in a similar memory-related study. The experiment was approved by the standing ethical committee of the Faculty of Psychology of Neuroscience, Maastricht University.

1.1.2. Materials and tasks

In the current experiment, presentation of the DRM words in all tasks (perceptual closure and recognition) was done visually. All tasks were digitalized on a Microsoft Windows computer, and presented with E-Prime 2.0 software. Single words from each wordlist were recreated as digital representations that contained a white background with the word centered in black. These representations were created using Adobe Photoshop CS6, with the words displayed in font "Calibri", size "125pt". All words were presented in Dutch.

All participants were presented with three consecutive tasks: (1) a digitalized DRM wordlist task including 10 counterbalanced standard DRM lists (5 neutral and 5 negative) with 10 words each (e.g., *baker, butter, crust, grain*) and each list was associated with a non-presented critical lure (i.e., *bread*). These lists have been used in previous research (e.g., Otgaar, Peters, & Howe, 2012). List items were chosen from the Dutch word association norms (Van Loon-Vervoorn & Van Bekkum, 1991) and were shown in order of backward associative strength, from strongest to weakest. We also guaranteed that the mean word frequency of the neutral and emotional critical lures did not differ, $t(8) = 0.22$, $p > .05$, by using the CELEX lexical database (Baayen, Piepenbrock, & Gulikers, 1995). Also, the mean backward associative strength between the neutral list words and their critical lures and the mean backward associative strength between the negative items and their critical lures did not differ, $t(8) = 1.69$, $p > .05$. Words were presented for 1500 ms and between each word a fixation cross appeared for 1 s, (2) a digitalized DRM recognition task, consisting of 78 words in total, of which 40 were studied during the presentation of the DRM lists (4 from each list), 10 critical lures (1 from each list), 10 non-presented related words (i.e., words related to the lists, not presented during encoding) and 18 non-presented and unrelated words. Words were presented for 1500 ms and after each word a white slide appeared for 200 ms, followed by a pop-up window in which participants had to answer "yes" or "no" in a self-paced manner, and (3) a digitalized perceptual closure task, containing 80 words in total of which 40 overlapped with the first task (of these 20 overlapped with the second task), 10 critical lures, 10 non-presented and related words and 10 non-presented and unrelated words that were also presented in the second task, and another 10 non-presented and unrelated words that were completely new. The words were displayed as visual representations containing a blur filter that became clearer over time. We included 10 gradual gradations of blurs (see Appendix). Each blur was presented for 1 s. The PCT task measured a button press response from participants as soon as the words were recognized. After the button press, a pop-up window appeared in which participants had to write the word they had seen in a self-paced manner.