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The influence of encoding style on the production of false memories in the DRM paradigm: New insights on individual differences in false memory susceptibility?

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ABSTRACT

Recent research has shown that there are individual differences in how preexisting schemata (internal vs. cues from the outside world) affect encoding processes, which can be reliably assessed with the internal and external Encoding Style Questionnaire (ESQ, Lewicki, 2005). Since reliance on preexisting schemata at encoding has been found to increase the production of false memories in the "Deese-Roediger-McDermott" paradigm (Roediger & McDermott, 1995), while item-specific encoding has been shown to reduce it (see Gallo, 2006), we wished to examine whether individual differences in encoding style might affect the production of such false memories. To this purpose, normal participants were asked to complete a French version of the ESQ questionnaire (Billieux, D'Argembeau, Lewicki, & Van der Linden, 2009) and were presented with a modified DRM procedure (Brédart, 2000) assessing false recall. Results showed that encoding style influenced the production of DRM false memories. Indeed, compared to external encoders, internal encoders produced more false memories while monitoring less critical lures.
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1. Introduction

The possibility to induce people to report false memories has recently captured the attention of both psychologists and the public at large. Consequently, psychologists have devised paradigms that investigate false memories in the laboratory. One of the most frequently used is the "Deese-Roediger-McDermott paradigm" (DRM; Deese, 1959; Roediger & McDermott, 1995) in which participants are asked to remember lists of associated words (e.g., pin, thread, eye, sewing, etc.) converging towards a critical theme word (the *lure*: needle) that is never presented. After studying such lists, participants typically recall or recognize the lure at high rates. In addition, these false recalls or recognitions are held with strong subjective confidence and are frequently accompanied by details related to the supposed presentation of the word (Lampinen, Neuschatz, & Payne, 1998), a phenomenon called "illusory" or "phantom" recollection.

Several explanations have been advanced to account for false memories in the DRM paradigm (for a review, see Gallo, 2006). Among them, the fuzzy-trace theory (FTT; e.g., Brainerd & Reyna, 2002) and the activation/monitoring theory (AMT; e.g., Mc Dermott & Watson, 2001; Roediger, Watson, McDermott, & Gallo, 2001), have gained large support over the last decade. Following these accounts, critical lures will be likely to seem familiar to individuals due either to activation (e.g., spreading of activation in a semantic network, elaboration, overt generation) or to reliance on gist traces encoded at study that represent the meaning or the common features of the stimuli, but which lack perceptual details. Both explanations rely on the availability of item-specific information for the successful editing of memories. That is, verbatim traces of presented items that capture the surface details of physical stimuli can be used to reject false-but-consistent information, or item-specific information can be used to correctly attribute the familiarity of the critical lure to the participant's own thoughts and not to the item's occurrence in the list through a successful reality monitoring process (Johnson, Hashtroudi, & Lindsay, 1993). However, they diverge as the AMT, posits that a single trace is created during encoding, while FTT posits that two traces are created at encoding (i.e., gist and verbatim traces). Following the individual's focus at study, according to the AMT, some aspects of the experienced event will be processed (and this could be done at the expense of other aspects) to create a single memory trace while, according to the FTT, one of the two processes (gist vs. verbatim processes) may be more salient. In addition, the FTT suggests that the activation of the critical lure at study is not a necessary condition for false memories to occur as they may seem familiar at retrieval because they are gist-consistent.

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In spite of these differences, both accounts maintain that information processing during list encoding plays an important role in false memory production. Accordingly, studies have shown that encoding manipulations such as presentation duration, presentation modality and levels of processing all influence levels of false memory (for a thorough review, see Gallo, 2006). More specifically, it has been shown that instructions promoting deeper (semantic) processing of DRM lists increase false memory for critical lures (Chan, McDermott, Watson, & Gallo, 2005; Toglia, Neuschatz, & Goodwin, 1999) while instructions focusing on, or promoting, item-specific information reduce false memory production (e.g., Dehon, 2006; Schacter, Israel, & Racine, 1999).

DRM task performance can also be mediated by individual differences such as, for instance, fantasy proneness (Geraerts, Smeets, Jelicic, van Heerden, & Merckelbach, 2005), and a tendency toward delusional ideation and dissociative experiences (Dehon, Bastin, & Larøi, 2008). However, to our knowledge, whether individual differences in encoding style may affect DRM task performance has not been investigated. And yet, such a hypothesis merits examination based on William James' well-known General Law of Perception (James, 1890), which states that the result of every act of perception is a combination of the objective external data (what "comes through our senses" in James' words) and the internal (subjective), interpretive schemata (what "comes out of our mind"). Recent research has revealed that there are individual differences in how these preexisting schemata (internal vs. external cues from the outside world) affect encoding processes. These differences relate to how "hasty" (or "internal", i.e., based on internal encoding categories) vs. "conservative" (or "external", i.e., based on data from external stimuli) the encoding processes are (Lewicki, 2005).

This hypothesized encoding style can be interpreted in terms of the validation threshold for instantiation of schemata, which is the relative amount of supportive evidence a perceiver needs to collect before imposing a knowledge framework (schema) on a stimulus. When stimuli are ambiguous, encoding algorithms may nonconsciously impose on them preexisting interpretative categories even if the stimuli objectively do not match with the categories very well (e.g., Lewicki, Hill, & Sasaki, 1989). Research indicates that the more internal the style of encoding, the greater the probability that environmental cues will be interpreted in terms of preexisting (internal) encoding categories, thus providing support for those categories and contributing to their reinforcement through a process of "self-perpetuation" (e.g., Lewicki, 2005; Lewicki, Hill, & Czyzewska, 1992).

Recently, a new scale has been developed to assess a person's encoding style: the Encoding Style Questionnaire (ESQ, Lewicki, 2005). This questionnaire is based on the assumption that the threshold of instantiation of schemata will determine the probability and, therefore, the frequency of experiencing the commonly observed phenomenon of "split-second illusions" by including questions about the frequency of having such "split-second illusions" experiences in everyday life (e.g., erroneously recognizing an animal moving off the road before, a moment later, finding out that it was a piece of paper moved by the wind). Indeed, because internal encoders are more likely to more "hastily" impose imperfect or even incorrect encoding schemata, they are likely to experience split-second illusions more frequently when identifying certain known objects or phenomena. Studies investigating the relationship between encoding style (as measured with the ESQ) and objective cognitive performance measures show, among other things, that internal encoders are more accurate than external encoders when they are exposed to tachistoscopic presentations of images of everyday objects or incomplete displays of letters and are asked to recognize them, implying that they exhibit a lower threshold of instantiation of interpretive schemata in the process of encoding (see Lewicki, 2005). Moreover, internal encoders show more self-perpetuation of newly acquired encoding algorithms (e.g., after watching a series of schematic drawings of faces generated by a computer and labeled either "race X" or "race Y", they are more likely to classify faces of a new type as belonging to either the "X"- or "Y"-race) as predicted from the fact that their threshold of instantiation of schemata is lower, which should facilitate the rate of self-perpetuation (see Lewicki (2005) and Lewicki et al. (1989), for examples of procedures used in research on self-perpetuation).

2. Overview of the current experiment

Provided that focusing on schematic (internal) processing over external cues should increase the susceptibility to produce false memories in the DRM paradigm, the purpose of the present study was to examine the influence of encoding style on the production of such false memories. The participants were asked to complete a French version (Billieux, D'Argembeau, Lewicki, & Van der Linden, 2009) of the ESQ scale and were also presented with DRM lists for a modified recall task (Brédart, 2000) resulting in estimates of activation and monitoring of non-presented critical lures. More specifically, after the memory test, participants were asked to say whether, during the learning phase or during the recall phase, a word came to their mind, but that they did not write it down during the recall task because they thought the experimenter had not produced it. Hence, with this paradigm it is possible to examine the distribution of the critical lures throughout the experiment and to determine the best explanation for why false memories did not occur for some trials (i.e., whether it is related to a monitoring success vs. an activation failure). Specifically, a failure to recall a critical lure either in the initial recall phase or during the added phase suggests that the list failed to evoke it (i.e., an activation failure). On the other hand, reporting a critical lure during the added phase for a list that did not initially produce a false memory is indicative of successful monitoring (see also Dehon, 2006; Dehon et al., 2008).

A correlational approach was used to investigate the relationship between scores on the ESQ scale, false recall, activation rate and monitoring of the non-presented critical lure. We hypothesized that ESQ scores would be positively associated with false recall. Indeed, participants with high scores on the ESQ, reflecting internal encoding and reliance on existing schemata (i.e., deep processing), would produce more false memories. In contrast, participants with low scores on the ESQ, reflecting a greater reliance on cues from the outside world (i.e., surface processing), would be more resistant to this illusion. In addition, this influence should also be reflected on monitoring abilities, with ESQ scores being negatively associated with monitoring abilities. That is, external encoders (scoring low on the ESQ scale) would be more efficient in source monitoring through the use of external cues, while internal encoders relying on existing schemata (or self-perpetuating these schemata) would be less able to make accurate source attributions (e.g., Johnson et al., 1993). Finally, we dichotomized (median-split) participants as "internal" vs. "external" encoders on the basis of their ESQ scores and compared their performances on the DRM task in order to obtain more direct evidence of the influence of encoding style on false memory production.

3. Method

3.1. Participants

A total of 188 participants (91 females, mean age = 25.62, SD = 3.53; ranged from 20 to 35; mean education = 15.24 years,

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