Inducing false memories by manipulating memory self-efficacy

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ABSTRACT

The aim of this paper is to investigate the relationship between self-efficacy and false memories using the Deese/Roediger–McDermott (DRM) paradigm, whereby people falsely remember words not presented in lists. In two studies participants were presented with DRM lists and asked to recall and recognize presented items. In the first study, we found a significant relationship between memory self-efficacy (MSE) and susceptibility to associative memory illusions, both in recall and recognition. They also received the Memory Self-Efficacy Questionnaire (MSEQ), the Big Five Questionnaire (BFQ) and the backward digit span (BDS) test.

In the second study, MSE was manipulated in order to assess whether changes influenced the sensitivity parameter in DRM tasks. Results showed that the manipulation was effective in decreasing self-efficacy, which in turn affected the probability of reporting critical lures as well as sensitivity. Possible explanations for the effect are discussed.

1. Introduction

Understanding individual differences in memory has become a crucial topic in modern psychological research. Moreover to understand the factors that influence memory illusions could help to improve the applications in several fields, like psychology of testimony, learning psychology and psychotherapy. In particular, our interest is in understanding the relationship between individual difference, as measured by state and trait factors, and false memory as measured using the Deese/Roediger–McDermott (DRM) paradigm.

In DRM paradigm, people study lists of associated words and then take a recall or recognition memory test. Each presented list is semantically associated to at least one specific non-presented words (known as critical lures; Roediger & McDermott, 1995) and are listed in backward associative strength (BAS), such that the most strongly associated word is presented first, then the second, and so forth. For example, one list includes *sour*, *candy*, *sugar*, *bitter*, *good*, *taste*, etc., which should elicit the false recall of the critical lure *sweet*.

There are several theories that can explain from different point of view the DRM illusion (see Gallo, 2010 for a review). Here we shortly report the Activation-Monitoring Theory (hereafter AMT) and the Fuzzy Trace Theory (hereafter FTT). This theory concerns the interaction between two processes. The firs process is the spread activation, which describes a higher probability for critical lure being falsely remembered, due to the repeated activation of characteristics that the critical lure shares with the other words in the list. This leads to remember the critical word as a list word. Nevertheless, the theory accounts a monitoring process that reduces false memories trying to determine the origins of this activated information and that a false memory occur when this process fail (e.g., Roediger & McDermott, 2000; Roediger, Watson, McDermott, & Gallo, 2001). (Benjamin, 2001; McDermott & Watson, 2001).

Also the FTT (Reyna & Brainerd, 1995; Brainerd & Reyna, 2002) assumes the intervention of a monitoring process during the memory task. However, differently from the AMT, this theory focuses on the storage of meaning relations; indeed the main assumption is the separate encoding of two type of memory trace: verbatim trace and gist trace. A verbatim trace contains the surface form of presented words and, by definition, it disappears earlier than the gist trace that is the representation of the list meaning. According to FTT, a false memory occurs with an illusory recollection of the gist trace.

In the present paper, we describe two distinct studies. In the first study we investigate the relationship between individual differences and false memories. In the second one, we manipulated the self-efficacy variable that we found to be related to false memories in the first study.

Presently, not many researches are conducted on the relationship between false memories and individual differences; most of them have focused on the manipulation of the DRM paradigm (Watson, Bunting, Poole, & Conway, 2005). In respect to this, (Sanford & Fisk, 2009) these studies showed a significant relationship between the associative networks of semantic and episodic memory and extroversion/introversion dimensions of personality as measured by the Big Five Questionnaire (BFQ) In the first study we retested the relationship

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between extraversion and false memories. Furthermore, because no studies investigated the relationship between MSE and Big Five of personality we are interesting in investigate it.

Even less research has been conducted regarding the focus of the present study, namely on memory self-efficacy (hereafter MSE), it has been conceptualized in two principal ways (Berry, 1999). In one approach, derived from Bandura's self-efficacy theory, MSE refers to the belief of holding efficient memory skills evaluated in the context of specific memory tasks (Berry, 1996; Beaudoin & Desrichard, 2011). Another approach, derived from the meta-memory framework, conceptualizes MSE as "one's sense of mastery or capability to use memory effectively in memory-demanding situations" (Hertzog, Dixon, & Hultsch, 1990). In this approach, MSE is a generalized judgment that is abstracted from specific tasks and situation characteristics.

Furthermore, in the present study we used MSE taking in to account the Bandura's suggestions (1997), therefore as based on various sources of information, including the appraisal of the relevant features of a task and situation, as well as task-specific, domain-specific, and global beliefs about one's memory abilities. One's concurrent MSE is based on the perceived characteristics of the memory task to be performed, on personal-state variables (e.g., concurrent physiological state and mood), and, whether no previous experience with the task is available, on more generalized beliefs about one's memory abilities (Hertzog et al., 1990).

Self-efficacy affects the ability to cope, which indirectly supports the hypothesis that the level of MSE affects cognitive performance (Heitzmann et al., 2011; Coffee & Rees, 2011). According to Bandura's self-efficacy theory (1989, 1997), higher confidence in one's memory leads to higher memory performance due to greater effort expenditure, greater persistence in the face of difficulties, higher performance goals, and lower state anxiety. Some studies have shown a significant positive correlation between MSE and working memory (hereafter WM) (Caldeira de Carvalho, Marcourakis, Artes, & Gorenstein, 2002; Potter & Hartman, 2006), others reported that WM is predictive of false recognition (Johnson, Hashtroudi, & Lindsay, 1993; Peters, Jelicic, Verbeek, & Merckelbach, 2007). Since WM could mediate the relation between MSE and DRM performance, we decided to include it in our analysis.

Because no previous study has assessed whether MSE affects the extent to which people develop false memories, we investigated this hypothesis using two different experiments. The focus of the first study was to examine the relationship between false memories and individual difference traits mentioned above. In the second experiment, we tested whether experimentally induced changes in MSE (considered as a state variable) produce changes in memory performance.

Experimental studies which try to manipulate personal variables such as MSE are rare, and in most cases do not include any measure of memory performance (e.g. Sanbonmatsu, Harpster, Akimoto, & Moulin, 1994). Among studies in which memory performance is assessed, one did not report any MSE manipulation effect on memory performance (Gardiner, Luszcz, & Bryan, 1997), while another reported an effect of manipulation on both MSE and memory performance but did not test whether the impact of manipulation on memory performance was mediated by MSE changes (Nicoson, Dick, Lineweaver, & Hertzog, 2008).

2. Study 1

The purpose of the first study was to investigate individual differences in false memory. Particularly we wanted to examine whether MSE can determine memory performance, using the DRM paradigm. In the DRM paradigm people study lists of associated words and then take a free recall and recognition memory test. The typical result is that people often falsely remember a non-studied critical word associated with the words in the list. According to self-efficacy theory (Bandura, 1989), individuals with low MSE should be less willing than individuals with higher levels of MSE to expend mental effort during the DRM tasks. We hypothesize that individuals with higher MSE are better able to

initiate intentional monitoring activities and screen out potential memory errors, including critical false memories, compared to individuals with low levels of self-efficacy. Moreover, we expect that only MSE for words is predictive of performance in the DRM paradigm, because this scale is closer to DRM conditions than the MSE scales for groceries and errands.

Furthermore, we tested the hypothesis that the confidence intervals of the recognition task could be related to MSE as a meta-memory task. As regards to BFQ, coherently with previous researches (e.g., Paddock, Terranova, Kwok, & Halpern, 2000; Sanford & Fisk, 2009) we aspect that extroverts produce a significantly greater number of false memories than introverts. In this study, we also assessed the role of WM in predicting performance of a DRM task.

2.1. Method

2.1.1. Participants

Forty-one native English speakers students from the University of Hull (UK), 10 were male, 31 were female (mean age = 20.6; SD = 4.35). Forty-one native Italian speakers students from the Sapienza University of Rome, 11 were male, 30 were female (mean age = 24.8; SD = 6.04).[1]

2.1.2. Materials

2.1.2.1. DRM lists.
Study items were 14 of the lists rated by Stadler, Roediger, and McDermott (1999) as producing medium levels of false recognition. Each list consisted of 15 associations of a non-presented critical lure (see Appendix A). The recognition test included a printed sheet containing 28 studied words (two from each list), 14 critical lures of the studied lists, plus 28 non-presented words semantically related with critical lures and 28 words unrelated to critical lures or any other word in this list. As the Italian language does not possess as many extensive association norms as the English language (Buchanan, Holmes, Teasley, & Hutchison, 2013), we translated the original English stimuli, matching use frequency, into Italian. For this purpose we referred to Corpus of Contemporary American English (Davies, 2008) and Corpus e Lessico di Frequenza dell'Italiano Scritto (Corpus and Frequency Lexicon of Written Italian) (Bertinetto et al., 2005).

2.1.2.2. Backward digit span (BDS).
This test is used to measure WM, attention, concentration, and mental control (Ostrosky-Solís & Lozano, 2006). In a typical test of memory span, a list of random numbers is read out loud at a rate of one item per second. At the conclusion of the list, participants are asked to recall all digits in reverse order. The test begins with three digits, increasing one digit after each two sequences of digits until people fail to report two sequences of the same length.

2.1.2.3. Memory self-efficacy questionnaire (MSEQ).
This questionnaire includes the description of several memory exercises (classic laboratory tasks and more everyday tasks) which must be carried out at different levels (Berry, West, & Dennehey, 1989). Subjects are required to decide whether or not they are capable of attaining each level of performance for each task and to state their level of confidence. For this study we selected three MSE scales: chores, groceries and words.

2.1.2.4. Big five questionnaire (BFQ).
This is a personality test (Caprara, Barbaranelli, Borgogni, & Perugini, 1993; Costa & McCrae, 1985) based on five major dimensions: openness, conscientiousness, extraversion, agreeableness and neuroticism. In this study, we used the 50 item short version of BFQ.

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[1] There were exclusion criteria that included psychiatric and learning disorders estimated asking participants if they had experienced in the past psychiatric disorders or learning disabilities and if they were used to assume drugs.