The role of language proficiency in producing false memories

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ABSTRACT

We report three experiments examining the role that language proficiency plays in the production of false memory. We constructed Deese-Roediger-McDermott paradigm lists using both English and Spanish free association norms, which enabled us to control the associations between studied items and critical words. Experiment 1 showed that native English speakers who were learning Spanish produced more false memory when DRM critical words were studied and tested in English compared to Spanish. Experiment 2 showed that native Spanish speakers who were learning English produced more false memory when DRM critical words were studied and tested in Spanish compared to English. Experiment 3 showed that native Spanish speakers who were highly proficient in English produced more false memory for DRM critical words studied and tested in English compared to native Spanish speakers who were lower in English proficiency. Collectively, these results support the role that the automaticity of concept access plays in producing false memory.

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Introduction

False memories have been extensively studied in monolingual speakers of many languages, including English (Deese, 1959; Roediger & McDermott, 1995), Spanish (Anastasi, Rhodes, Marquez, & Velino, 2005; Beato & Arndt, 2014; Beato & Díez, 2011), Portuguese (Carneiro & Fernandez, 2013; Carneiro et al., 2012), French (Corson & Verrier, 2007; Corson, Verrier, & Bucic, 2009; Dubuisson, Fiori, & Nicolas, 2012), Dutch (Van Damme & d'Ydewalle, 2009), Japanese (Kawasaki & Yama, 2006; Kawasaki-Miyaji, Inoue, & Yama, 2003), and Italian (Sergi, Senese, Pisani, & Nigro, 2014). The Deese–Roediger–McDermott (DRM) paradigm (Deese, 1959; Roediger & McDermott, 1995) had been the most commonly-used experimental paradigm to study false memories in the laboratory, and typically entails the presentation of a list of words to study (e.g., *thread*, *pin*, *eye*, *sewing*, *sharp*, *point*, *prick*, *thimble*, *haystack*, and *thorn*), all of them associated to a non-presented *critical word* (e.g., NEEDLE). On a subsequent memory test, participants often falsely recall or recognize critical words, even though the critical word was not studied.

One question that has been investigated in the literature is how language proficiency influences the incidence of false memories (for a review, see Graves & Altarriba, 2014). For example, studies have compared the rate of false memories produced when people study DRM lists in their native (and dominant) language and their second (non-dominant) language (Sahlin, Harding, & Seamon, 2005). In many of these studies, DRM lists were translated from the original English lists (Deese, 1959; Roediger & McDermott, 1995; Stadler, Roediger, & McDermott, 1999) to a second language, such as Spanish (Marmolejo, Diliberto-Macaluso, & Altarriba, 2009; Sahlin et al., 2005) or French (Cabeza & Lennartson, 2005; Howe, Gagnon, & Thouas, 2008). These studies have generally found that false memories are greater when DRM lists are studied and tested in participants' dominant language compared to their non-dominant language (Howe et al., 2008; Sahlin et al., 2005; but see Cabeza & Lennartson, 2005 for an exception). However, studying the rate of false memories across participants' dominant and non-dominant languages by directly translating DRM lists from English to another language may be problematic because the strength of the associations between study words and critical words can differ across languages (Marmolejo et al., 2009). Thus, studies that directly translate English DRM lists to other languages are comparing the level of false memory across languages by using lists that may have stronger associative relationships in the participants' dominant language (English) than in their non-dominant language (Spanish or French), which could account for the differences in false memory in bilinguals' dominant and non-dominant languages. As a result, it would be preferable to build, for example, Spanish lists from Spanish free-association norms in the same way

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that English lists are built from English free-association norms (Marmolejo et al., 2009).

There are only two studies that have investigated how false memory is affected by language proficiency and used DRM lists constructed from association norms in each language (Anastasi et al., 2005; Kawasaki-Miyaji et al., 2003). First, Anastasi et al. (2005, Exp. 2) examined false memory in participants' native language (Spanish) and their second language (English), and found that critical word false alarms were greater in the second language (English) than the first language (Spanish). However, these participants were highly fluent in English, and because they lived in the United States, used English regularly in their daily lives. Thus, it is possible that English was the participants' dominant language, which hinders the interpretation of this result as being due to the influence of language proficiency on false memory. In an effort to address this problem, Anastasi et al. (2005) tested monolingual Spanish (Exp. 3) and English (Exp. 4) speakers. In these last two experiments, the results favored the view that greater expertise in a language produced greater false memory. Specifically, participants falsely recognized more critical words in their native (and dominant) language (Spanish, Exp. 3, and English, Exp. 4) than in the language they did not speak. However, it is unclear if this result truly was due to greater proficiency with a language. In particular, studying monolingual participants may simply compare a condition where participants were able to access all of the concepts a word referred to (when they studied DRM lists in the language they spoke) and a condition where they were unable to access many or most of the concepts words referred to (when they studied DRM lists in the language they did not speak). Thus, while Experiments 3 and 4 of Anastasi et al. (2005) established that their DRM lists in both Spanish and English were able to evoke false memories when participants spoke those languages, those studies do not necessarily imply that greater language proficiency increases false memory.

Second, Kawasaki-Miyaji et al. (2003) studied Japanese-English bilinguals for whom Japanese was their native and dominant language, and constructed DRM lists using both Japanese (Miyaji & Yama, 2002) and English (Nelson, McEvoy, & Schreiber, 1998) free-association norms. Some DRM lists were tested in the same language as they were presented at study (i.e., Japanese-Japanese, English-English) while other DRM lists were tested in a different language than they were presented at study (i.e., Japanese-English, English-Japanese). The results generally showed that false recognition of critical words was greater when the test language was Japanese (participants' native and dominant language) than English (participants' second and non-dominant language). One complication with interpreting this result is that false alarm rates to unstudied, unrelated test items were not reported separately for items tested in Japanese and English. Thus, the finding that participants falsely recognized critical words more often when they were tested in Japanese is hard to interpret because it could simply reflect a bias to respond "studied" for items tested in Japanese. Further, when participants who had higher levels of English proficiency (balanced bilinguals) were compared with participants who had lower levels of English proficiency (unbalanced bilinguals), no differences in critical word false memory were observed. This result suggests that greater proficiency with a language does not produce greater levels of false recognition, in contrast to the conclusions of Anastasi et al. (2005).

In summary, studies of false memory in individuals with different language proficiency generally indicate that false recognition is lower in participants' non-dominant language compared to their dominant language. However, as noted above, there are two important limitations of existing studies. First, many studies have directly translated DRM lists from English to another language, instead of constructing DRM lists based upon association norms

in each language (Howe et al., 2008; Marmolejo et al., 2009; Sahlin et al., 2005). This method of examining false memory in different languages leaves open the possibility that the DRM lists in participants' dominant language (English) were better able to elicit false memories than translated DRM lists in participants' non-dominant language. That is, it is possible, and perhaps likely, that translated lists had weaker overall associative relationships between studied items and critical words (Graves & Altarriba, 2014), which is known to produce lower levels of false memory for critical words (Roediger, Watson, McDermott, & Gallo, 2001). Thus, although the results of studies showing greater false memory in participants' dominant language compared to their non-dominant language can be interpreted to support the claim that greater language proficiency produces greater false memory, there are other, equally-plausible interpretations of this finding that do not claim that language proficiency differences affect false memory. Second, of the two studies that have constructed DRM lists using association norms specific to the two languages participants speak (Anastasi et al., 2005; Kawasaki-Miyaji et al., 2003), one study has favored the conclusion that greater language proficiency is associated with greater critical word false memory (Anastasi et al., 2005), while the other (Kawasaki-Miyaji et al., 2003) did not find differences in critical word false memory as a function of non-dominant language proficiency. Thus, there is uncertainty regarding whether variations in language proficiency are associated with differences in false memory.

An interesting parallel to studies examining the relationship between language proficiency in bilinguals and false memory is that there are also differences in false memory across development. Studies of false memory in children and adults using the DRM paradigm have consistently shown that false memory increased with age, such that children produced lower levels of false recognition than adults (Brainerd, Forrest, Karibian, & Reyna, 2006; Brainerd, Reyna, & Forrest, 2002; Carneiro, Albuquerque, Fernandez, & Esteves, 2007; Carneiro & Fernandez, 2010; Howe, 2006; Howe et al., 2008). This same developmental pattern has also been found when comparing younger and older children, such that older children produce more false memories that younger children (Carneiro & Fernandez, 2010).

According to Carneiro and Fernandez (2010), improvements in language proficiency across development explain the differential susceptibility to false memories that younger children have compared to older children and that older children have compared to adults. A second viewpoint that also explains developmental changes in false memory is offered by associative activation theory (Howe, Wimmer, Gagnon, & Plumpton, 2009). This theory claims that older children and adults are more susceptible to false memories than younger children because of increases in the strength and organization of associations in semantic memory, as well as the automaticity with which concepts are activated by words and activation spreads among associations. Thus, associative activation theory suggests that older children and adults are more likely to activate critical words' representations in semantic memory, resulting in higher levels of false memory.

Given the parallel between how false memory differs between individuals with different language proficiency and the developmental trajectory of false memory, it is possible to view the changes across cognitive development as comparable, at a theoretical level, to (1) the difference in dominant and non-dominant language proficiency in adults and (2) changes in non-dominant language proficiency in adults as second language learning progresses (Carneiro & Fernandez, 2010). This view would suggest that young children who study DRM lists in their native language and adults who study DRM lists in their non-dominant language will have lower levels of false memory than adults who study DRM lists in their dominant language because of differences in the strength