

**When false memories do not occur:**

**Not thinking of the lure or remembering that it was not heard?**

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## **Abstract**

The aim of the present study was to evaluate two explanations for the non-occurrence of false memories in the Deese-Roediger-McDermott (DRM) paradigm. One explanation was that a critical lure is not recalled because the list failed to evoke it in the participant's mind. Another possible explanation was that the participant would identify the critical lure and would remember, at the time of recall, that the lure was not produced by an external source. In order to explore these two possible explanations for the non-occurrence of false memories, an experimental phase was added to the usual DRM paradigm: participants were asked to recall items they thought of but they did not recall because these items were not members of the list presented by the experimenter. Among participants who did not recall the critical lure during the standard recall task, those who recalled the critical lure during the additional phase outnumbered those who did not recall it. This result is more consistent with the second explanation than with the first one.

## INTRODUCTION

In recent years, the Deese-Roediger-McDermott (DRM) paradigm has been widely used in order to study the occurrence of false memories. In this paradigm lists of thematically related words such as *bed, rest, awake, tired, dream*, etc., are presented to participants. On later memory tests (e.g. recall or recognition tests) participants often claim to remember a word which was not actually presented (the critical lure) such as *sleep*.

Important properties of this “false memory” effect have been described in the literature. Subjects appear to be highly confident that the critical lures were presented (Payne, Elie, Blackwell, & Neuschatz, 1996; Roediger & McDermott, 1995) and claim to recall or recognize the critical lures on the basis of conscious recollection rather than a mere familiarity feeling (Payne et al., 1996; Roediger & McDermott, 1995). According to Mather, Henkel, & Johnson (1997) the rate of “Remember” responses is, nevertheless, higher for actually presented items than for critical lures. Moreover, subjects often attribute an external source to the critical lures, and they do it only slightly less often than they attribute a source for actually presented items (Lampinen, Neuschatz, & Payne, 1999; Payne et al., 1996). Several studies have shown that this false memory effect persists over retention interval of 24 and 48 hours (McDermott, 1996; Payne et al., 1996; Roediger & McDermott, 1995). More recently, Toglia, Neuschatz and Goodwin (1999) showed that long retention interval (one week and three weeks) had no effect on recall of critical non-presented items and on the confidence in these illusory recollections.

Several researchers have found evidence for differences between the qualitative characteristics of true and false memories. Mather et al. (1997) reported that memories for perceived words include more auditory detail and more remembered feelings than memories

for critical lures. Norman and Schacter (1997) found that subjects recalled more sensory and contextual detail (e.g. information concerning the list position) for studied items than for nonpresented theme words. More recently, Lampinen et al. (1999) showed that subjects were more confident in their source attributions for presented items than for critical lures. They were also more likely to change source attributions for critical lures than for presented items. Although there are subtle differences between true and false memories, the false memory effect obtained in the DRM paradigm is very robust (for an extensive review see Roediger, McDermott & Robinson, 1998).

The aim of the present study was to address the following question: Why do some participants recall no false memories? One possible explanation for an absence of recall of a critical lure is that the list did not cause the participant to think of the target theme-consistent word. A completely different explanation is that the participant did think of the critical lure while hearing the list but was able to remember that the word had not, in fact, been presented by the experimenter (or another external source). Which of these explanations best accounts for the absence of occurrence of false memories? Do participants recall no false memories because they do not process the critical lure, or rather, because they successfully remember that the critical lure was not uttered by an external source?

In order to evaluate these hypotheses, the classical phases of the DRM paradigm i.e. recall (phase I) and confidence rating (phase II) were followed by a phase during which, for each list, participants were asked to say whether a word came to their mind during the experiment but they did not recall it because they thought it had not been uttered by the experimenter. The two hypotheses discussed above lead to divergent predictions about what participants who did not recall the critical lure in phase I will do during this additional phase (phase III). If the first explanation is correct, it is predicted that, among participants who did not recall a critical lure in phase I, those who will not recall this critical lure in phase III

should outnumber those who will recall it in this phase. Indeed, a participant who did not think of a critical lure in phase I is not likely to recall it in phase III.

The prediction from the second explanation is the opposite. According to this explanation participants who did not recall a false memory in phase I processed the critical lure but remembered that this word was not spoken by an external source. If this explanation is correct, it is predicted that, among participants who did not recall a critical lure in phase I, those who then recall this critical lure in phase III should outnumber those who do not recall it.

## METHOD

### *Participants*

Forty undergraduate student volunteers (27 females, 13 males) participated. Their ages were between 18 and 28 (mean age = 22.4 years).

### *Materials*

The study material consisted of 8 lists of 10 items (all the lists appear in the Appendix). These lists were constructed on the basis of two pilot studies. In the first pilot study 10 participants were presented with 10 lists of words. For each list, these participants' task was, first, to identify the person who was associated with the presented words, and then to rate the degree of association between each word and the target person on a 7-point scale (1 = word not associated with the target person; 7 = word strongly associated with the target person). For the 8 lists, each target person was identified by all the participants. These target persons were four cartoon characters (Captain Haddock, Lucky Luke, Obelix and Peter Pan) and four real persons (Louis De Funès (a French actor), Adolf Hitler, J. F. Kennedy and Claudia Schiffer). A one-way ANOVA taking the words as the random factor showed that the mean degree of associations between list words and their target person (mean = 4.96; sd = 0.44) did not vary significantly across the lists ( $F(7,72) = 1.28$ ;  $MSe = 1.72$ ;  $p > .20$ ).

The second pilot study was aimed at evaluating whether the 8 lists were equally effective with respect to the generation of a mental image of the target person. Fifteen new participants listened to the experimenter reading each list of words in the same conditions as those described below for the main experiment. Participants were instructed to stop the experimenter's reading each time the mental image of a person not mentioned before came to mind and to name that person. If the mental image corresponded to the target person then the

experimenter said “OK” and passed to the following list, otherwise the experimenter went on reading the list until the next stop. A one-way ANOVA taking the subjects as the random factor was carried out on the number of words read by the experimenter before the participant gave a stop signal and named the target person. This analysis revealed no significant difference across the lists ( $F(7,98) = 1.07$ ;  $MSe = 2.04$ ;  $p > .20$ ; mean number of words read = 2.75,  $sd = 0.36$ ). None of the subjects involved in the pilot studies participated to the main experiment.

### *Procedure*

Participants were tested individually. They were told that 8 lists of 10 items each would be read by the experimenter and that they would be tested immediately after each list by writing (using a black pen) the words on an experimental sheet. They were asked to recall as many words as possible in any order from the list they had just heard. They were also instructed not to guess wildly. The 8 lists were presented in a different random order to each participant. The lists were read aloud at the approximate rate of 1 word per 1.5 sec. Within each list, items were presented in order of decreasing association with the target person’s name (the critical lure). Participants were given 90 seconds to recall each list (Phase I).

In the first post-recall task (Phase II), the participants were asked to assign a rating between 1 and 5 for each recalled word to reflect their confidence in having heard the word as part of the list (1 = not very confident, 3 = fairly confident and 5 = extremely confident that the experimenter uttered the word).

In a second post-recall task (Phase III), the participants were given a brown pen and were instructed as follows: “While I was reading the words of a list or during the recall task, it could have been that a word came to your mind but you did not write it down because you

thought that I had not produced it". Then, the experimenter presented successively each list of words recalled by the participant in phase I and asked him or her to write the word(s) he or she had thought of for that list. Participants were asked to write only words they remembered having thought of during the presentation of lists and not to infer or guess words from the present instructions. Finally, the participants were asked to assign a rating between 1 and 5 for each word recalled in phase III to reflect their confidence in not having heard the experimenter producing that word (1 = not very confident, 3 = fairly confident and 5 = extremely confident that the experimenter did not utter the word.

## RESULTS

*Correct recall and confidence.* First, the eight lists were compared with respect to the correct recall of presented items. The proportion of participants who made a correct recall was computed for each item. In all statistical analyses that follow the alpha level was set at .05. A one-way ANOVA taking the items as the random factor showed no significant difference across the eight lists ( $F(7,72) = 0.60$ ;  $MSe = 0.023$ ). Descriptive data are presented in table 1.

The lists were then compared with respect to confidence ratings assigned to correctly recalled items. The mean rated confidence was computed for each item across participants who correctly recalled the item. A one-way ANOVA taking the items as the random factor showed no significant difference across the lists ( $F(7,72) = 1.31$ ;  $MSe = 0.032$ ). Descriptive data are presented in Table 1.

In short, correct recall of presented words and confidence in having heard these items were similar across the different lists used in the experiment.



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INSERT TABLE 1 ABOUT HERE  
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*False recall and confidence* (Phase I). The numbers of participants who recalled the critical lures across the eight lists is presented in Table 2. Although a formal analysis using a chi-square analysis in order to compare the eight lists was not possible (the proportion of cells in which the expected values were smaller than 5 exceeded .20) it appeared that the number of occurrences of the critical lures strongly varied across the lists. A chi-square analysis carried out on the six lists which produced at least one false memory was technically possible and confirmed that impression by showing a statistically significant difference (chi-square = 36.63; df = 5).

Although the lists were similar with respect to the average degree of association with the target person and their effectiveness in generating a mental image of the critical lures, only two lists induced a fair number of false memories. The *Claudia Schiffer* list induced the recall of the critical lure in 40 percent of the participants and the *Obelix* list in 20 percent of participants.

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INSERT TABLE 2 ABOUT HERE  
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Overall, 25 participants (62.5%) recalled at least one critical lure in phase I. As in Read (1996), confidence ratings assigned to study words were compared to confidence ratings

assigned to critical lures for these participants. As in Read's (1996) study, confidence ratings assigned to recalled study items (mean = 4.71; sd = 0.26) and critical lures (mean = 4.05; sd = 0.94) were significantly different ( $t(24) = 3.35$ ). This significant difference is difficult to interpret because of the ceiling effect occurring for ratings assigned to study items. Nevertheless, the mean confidence assigned to critical lures is relatively high, slightly higher than that reported by Read (i.e. 3.81) who also used a 5-point rating scale.

*Not processing the lure or remembering that it was not heard?* (Phase III). An important point of the present study was to examine the recall of critical lure in phase III in order to better understand how to explain the non-occurrence of false memories in a DRM-like situation. The following analyses concerned the responses of participants who did not recall false memories in phase I. The number of participants who produced the critical lure in response to the instructions given in phase III is presented in Table 2. For each list, a chi-square test was used to compare the number of participants who recalled the critical lure in phase III with the number of participants who did not (column "no recall" in Table 2). These analyses reveal that for every list the number of participants who recalled the critical lure was significantly higher than the number of participants who did not (using the same order of presentation of lists as in Table 2, the chi-square values were respectively 6.00, 10.12, 6.08, 4.57, 9.26, 4.33, 8.10 and 19.60 with 1 degree of freedom for each analysis).

Overall, 38 participants recalled critical lures in phase III. Their mean confidence of not having heard the critical lures was 4.38 (s.d. = 0.60).

Finally, the number of occurrences of recall of the critical lure in one of the recall tasks (either phase I or phase II) was not significantly different across the eight lists (chi-square = 7.46; df = 7;  $p > .30$ ).

## DISCUSSION

A large diversity in the effectiveness of the lists in inducing false memories was observed. Wide differences in effectiveness of the lists have also been recently reported by Stadler, Roediger and McDermott (1999). As shown by Stadler et al., it is not easy understand which factors underlie such a variability. In the present study, the two lists which induced a fair number of false memories shared the following property: the critical lure was similar to a study item both with respect to physical resemblance of the persons and to phonological similarity of the names. Obelix (critical lure) and Asterix (study item) are both Gallic warriors bearing a moustache, braids and a helmet covering just the top of the head. Their names contain three syllables and end with the phonemes /iks/. Claudia Schiffer (critical lure) and Cindy Crawford (study item) are both beautiful young (around 30), Caucasian, long haired and tall top models. Their names are composed of a two-syllable first name and a two-syllable surname. Moreover, in both cases, the two persons are often contextually associated. Asterix and Obelix are very often pictured together in the “Asterix” strip cartoon. Cindy Crawford and Claudia Schiffer appeared together in advertising pictures (e.g. for cosmetics) and they are often seen both on the same pages of magazines or in TV programs reporting fashion shows. The importance of associative relatedness (i.e. frequent co-occurrence) has been demonstrated in the field of familiar people recognition. Indeed, it has been shown that associative relatedness rather than category membership per se is responsible for the so-called “semantic priming” of face recognition (Barry, Johnston, & Scanlan, 1998; Young, Flude, Hellowell, & Ellis, 1994). Investigating the influence of such factors in the future should

contribute to a better understanding of why some lists are more effective in inducing the recall of critical lures when these lures are people's names.

The aim of the present study was to evaluate two possible explanations for the non-occurrence of false memories. The absence of recall of a critical lure could be due to the fact that a list did not lead a participant to think of the target name. Another explanation for this absence of false memory is that the participant thought of the target name while hearing the list and was able to keep in mind that this name had not been produced by an external source. A new experimental phase was added to the usual recall (Phase I) and confidence rating (Phase II) phases of the DRM paradigm in order to test these hypotheses. During that additional phase (Phase III) participants were instructed to recall words they thought of but they did not recall in phase I because those words were not uttered by the experimenter. If the first explanation is correct, we should find, among those participants who did not recall the critical lure in phase I, more participants who would not recall the critical lure in phase III than participants who would recall it. The reverse prediction could be made from the second explanation.

Results are more consistent with the second explanation than with the first. Indeed, for all the lists, there were significantly more participants who recalled the critical lure in phase III than participants who did not. Thus, the absence of recall of a critical lure in phase I seems to be mainly explained by the fact that the participant identified the target person while hearing a list but was able to remember that this person's name was not produced by an external source. The non-occurrence of false memories is best explained by a successful source monitoring activity rather than by the fact that a list failed to make the critical lure come to the participant's mind. One cannot totally exclude that in some cases a critical lure was not recalled because the participant did not identify the target person while hearing a list.

Indeed, the proportions of participants who did not recall the critical lure in phase III varied from .15 to .33 across the lists (see Table 2). But the non-identification of the target lure did not appear to be the major cause of absence of recall of false memories. It might be argued that an absence of recall of the critical lure in phase III does not necessarily mean that this critical lure was not activated at all during encoding. However, this possibility does not alter the conclusion of the study. Indeed, such an argument may imply that the number of participants who did not identify the target person in phase I was overestimated. But this argument does not concern the estimate of participants who processed the critical lure in phase I and remembered that it had not been produced by an external source. Therefore, in the present study, the absence of recall of false memories remains better explained by an ability to remember that the critical lure was not heard than by a non-identification of the lure.

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	Correct recall	Confidence
List	<hr/>	
Claudia Schiffer	0.81	4.79
Obélix	0.83	4.76
John F. Kennedy	0.76	4.77
Peter Pan	0.84	4.77
Louis De Funès	0.74	4.67
Captain Haddock	0.78	4.63
Adolph Hitler	0.76	4.70
Lucky Luke	0.81	4.65
<i>M</i>	0.79	4.72

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Table 1. Proportion of participants who recalled a study item averaged across the ten words of each list and mean confidence ratings assigned to correct recalls.



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List	Recall of the critical lure in		No recall
	Phase I	Phase III	
Claudia Schiffer	16	18	6
Obélix	8	25	7
John F. Kennedy	3	26	11
Peter Pan	3	25	12
Louis De Funès	1	29	10
Captain Haddock	1	26	13
Adolph Hitler	0	29	11
Lucky Luke	0	34	6

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Table 2. Number of occurrences of recall and of absence of recall of the critical lure in phase I and in phase III for each list.

## APPENDIX

*Critical lures with list items 1 to 10. The names of strip cartoon characters are sometimes different in the English and in the French version of the story. In such cases, the name used in the French version is given into parentheses.*

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CLAUDIA SCHIFFER: David Copperfield, fashion, Citroën Xantia, Cindy Crawford, Naomi Campbell, Kate Moss, Brigitte Bardot, magazine, accent, engagement

OBELIX: Asterix, menhir, potion, Dogmatix (Idéfix), Getafix (Panoramix), boar, Falbala, pot, Caesar, helmet

JOHN F. KENNEDY: Assassination, Marilyn Monroe, Bill Clinton, Dallas, Kevin Costner, democrat, Richard Nixon, Ronald Reagan, airport, bridge\*

PETER PAN: Captain Hook, Tinkerbell, Wendy, Mr Smee (Mr Mouche), Robin Williams, flight, London, crocodile, flute, alarm clock

LOUIS DE FUNES: gendarme, St Tropez, rabbi, sucker (corniaud), Bourvil, gallivant, Michel Galabru, Jean Lefèvre, Yves Montand, Jean Marais

CAPTAIN HADDOCK: Tintin, oath, alcohol, pipe, beard, Calculus (Tournesol), Snowy (Milou), Dupont, cap, Castafiore

ADOLPH HITLER: Nazi, extermination, race, Berlin, Mussolini, Le Pen, Stalin, suicide, Pétain, Pinochet

LUCKY LUKE: Jolly Jumper, cow-boy, revolver, shadow, Joe Dalton, Rintincan (Ran Tan Plan), speed, cigarette, Calamity Jane, Billy The Kid

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\* One of the main bridges in Liège is called the “Kennedy Bridge”.

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