Psihologijske teme, 27 (2018), 3, 365-384

Izvorni znanstveni rad – UDK – 159.953.2.072
doi:https://doi.org/10.31820/pt.27.3.2

Context Recollection and False Memory of Critical Lures in the Deese/Roediger-McDermott Paradigm: The Role of Encoding- and Retrieval-Based Mechanisms

Marek Nieznański, Michał Obidziński, Daria Niedziałkowska, and Emilia Zyskowska

Cardinal Stefan Wyszyński University in Warsaw, Institute of Psychology, Poland

Abstract

We examined the role of context memory for false recognition of critical lures and for illusory recollection of context in the Deese/Roediger-McDermott paradigm. In order to manipulate context (colour) memory, we asked the participants to read vs. generate items during the study and we presented items from one list using blocked- or mixed-colour formats. Both manipulations confirmed its influence on colour identification. Using signal detection analyses, we estimated memory sensitivity and response bias parameters, assuming that the former reflects encoding-mechanism influences, whereas the latter reflects retrieval-based mechanism effects. Our results showed no evidence for diagnostic monitoring, that is, the participants did not use failure of colour recollection as a retrieval strategy for lures rejection. However, we also showed that in the blocked-colour condition, the better memory for targets colours was related to a better gist memory and a stronger proneness to attribute the list-colour to corresponding critical lures. We interpret these results as indicating that participants "misbind" contextual details to activated critical lures at encoding and/or "borrow" these details at retrieval to corroborate the strong familiarity of critical lures.

Keywords: DRM paradigm, context memory, false recognition, illusory recollection

Introduction

One of the most popular experimental procedures used to study the phenomenon of false memory was introduced by Deese (1959) and subsequently revived and modified by Roediger and McDetmott (1995). In the Deese/Roediger-McDermott (DRM) paradigm, participants study lists of words that are related to a non-studied word ("critical lure"). For example, they study such words as *nurse, sick, medicine, health, hospital, dentist, patient,* etc., which are associates of the non-

✉ Marek Nieznański, Instytut Psychologii, UKSW; ul. Wóycickiego 1/3 bud. 14; 01-938 Warsaw, Poland. E-mail: *mnieznanski@wp.pl*

studied word DOCTOR. At the test, participants often mistakenly recall or recognise this critical lure and even declare a high confidence and remembering learning that item vividly. The DRM paradigm has had a widespread influence on memory research and generated much experimental and theoretical interest (e.g. Dodson, Koustaal, & Schacter, 2000; Gallo, 2006).

The most prominent theoretical framework used to explain false memory in the DRM paradigm is the activation-monitoring account (Roediger, Watson, McDermott, & Gallo, 2001). This account proposes two sets of processes that affect false memory. The first set of factors reflect the influence of spreading activation from studied list-words to the non-studied critical lures. The second set of factors is related to the monitoring of memory accuracy. Activation processes are predominantly the product of encoding, whereas monitoring processes generally occur at retrieval (Arndt & Gould, 2006). A critical lure can be rejected at a test if the participant effectively monitors the origin of the feeling of familiarity evoked by this distractor (e.g. Bruce, Phillips-Grant, Conrad, & Bona, 2004; Carmichael & Gutchess, 2016). In a sense, errors in the DRM paradigm are failures of source (reality) monitoring (Johnson, Hashtroudi, & Lindsay, 1993) because internal activation is misattributed to an external source. In accordance with this view, Unsworth and Brewer (2010) showed, using latent variable analysis, that individuals with superior source-monitoring abilities are less susceptible to false recalls than individuals with poor source-monitoring abilities.

An alternative approach to false memory in the DRM paradigm, the global-matching models (e.g. Arndt, 2015), assumes that false recognition is a function of the match between the critical lure used as a "memory probe" during retrieval and the memory traces of studied associates. These memory traces are composed of both item information and context information; this is why critical lure presentation may induce the retrieval of contextual information associated with presented words. Yet another approach, the fuzzy-trace theory (e.g. Brainerd & Reyna, 1998, 2002ab; Brainerd, Reyna, & Kneer, 1995; Brainerd, Reyna, & Mojardin, 1999) assumes that two types of memory trace are encoded in parallel; these are *verbatim traces* that contain surface information of individual targets, and *gist traces*, which store the meaning content of studied targets. Strong gist memory may induce an experience of the recollection of an encoding episode, a phenomenon called *phantom recollection*. Critical lures are accepted during memory test because they share their meaning with the stored gist traces. The memory traces may disintegrate over time, and fragments of traces may become associated with the wrong context (Reyna & Lloyd, 1997).

The aim of the present study was to test the consequences of context (source) memory *experimental manipulation* on false recognition of critical lures and illusory context recollection in a DRM task. It appears that both positive and negative influences of context memory enhancement for memory accuracy can be predicted on the basis of research literature reviewed in the following sections of this introduction. On the one hand, we can expect that – due to a good memory of the contextual details (e.g. font colour) of the studied words – participants may effectively reject lures for which they fail to recollect these diagnostic details. This would result in a lower level of false acceptances of critical lures and unrelated distractors (cf. Bruce et al., 2004; Mather, Henkel, & Johnson, 1997). On the other hand, it is also possible that these diagnostic details can be "borrowed" from targets and misbound or misattributed to critical lures, increasing false recognition instead of reducing it. Hence, better perceptual processing of, for example, font colour, may lead to the illusion of colour memory for actually non-studied words (cf. Franks, Butler, & Bishop, 2016; Lampinen, Meier, Arnal, & Leding, 2005; Nieznański & Tkaczyk, 2017).

Disqualifying Monitoring and Diagnostic Monitoring as Mechanisms of False Memory Reduction

According to Gallo (2006), true recollection of study details can be used to avoid false recognition through two decision mechanisms: disqualifying monitoring or diagnostic monitoring. The first occurs when the remembering of one event excludes another event as being presented during the study. The second process, diagnostic monitoring, is based on the failure to recollect expected details. The absence of recollection allows one to infer that the test item probably did not occur. In consequence, the more expected the recollection of a specific detail is, the more justified the decision of rejecting the item that does not evoke remembering of this detail seems to be. However, we cannot be sure that participants spontaneously use this diagnostic monitoring process. One way to force them to carefully monitor their memories in search for diagnostic details is to use a source-monitoring test, in which they are directly asked about the presence of context (source) details bound with targets. Surprisingly, changing the response format from the *yes/no* recognition to the source-attribution test does not necessarily result in false recognition reductions (Hicks & Marsh, 2001). The reason for this ineffectiveness of editing processes may be a poor memory for diagnostic details or similarity of sources (Hicks & Marsh, 1999; for a discussion see Gallo, 2006).

It seems that decision mechanisms reducing false recognition are more effective when studied items are more distinctive (cf. Hunt, 2003). The absence of a recollection of distinctive details provides stronger diagnostic evidence that an item was not studied than the absence of recollection of nondistinctive characteristics. Schacter and colleagues (e.g. Dodson & Schacter, 2001; Schacter, Israel, & Racine, 1999) call such a retrieval strategy *the distinctiveness heuristic*. This heuristic is applied globally to all of the items on the recognition list. Therefore, participants do not demand access to distinctive (e.g. pictorial) details before accepting an item as being old if some of the DRM lists were studied with pictures and others with words only, for example. However, it seems that the reduced proportion of false recognition does not have to result from a global change in a decision criterion. Instead of a general metamemorial belief, recognition decisions can be based on the retrieval of verbatim memory traces for individual items (McCabe, Presmanes, Robertson, & Smith, 2004).

A good example of a variety of monitoring processes operating during DRM task performance is provided by Lampinen et al. (2005). Participants in their studies were asked to think out loud while learning DRM lists and while making *remember/know* judgements at a test. This procedure allowed a comparison to be performed of what the participants said for presented targets with what they said for falsely remembered critical lures during test. Some of the critical lures were deliberately rejected by the participants because they recalled a related target; in spite of that, these two items were not mutually exclusive – they declared that a recollection of one's target presentation negates the likelihood that a related item was presented. Another mechanism of memory accuracy monitoring confirmed by the thinking-out-loud procedure was the distinctiveness heuristic. As mentioned above, participants exclude some of the lures by comparing their vividness with the distinctiveness of their memory for targets. Lampinen et al. (2005) also demonstrated the existence of an idiosyncratic distinctiveness heuristic that operates at the level of individual items – participants sometimes expected an item being well remembered because of its personal importance (Lampinen et al. gave an example of a participant who said: "Mountain: I don't think it was on there because my street name is Mountain and I would have probably thought of that").

Content Borrowing and Misbinding as Mechanisms of Illusory Recollection

However, all these editing mechanisms are not entirely successful. Even strict warnings provided to the participants about the associative errors in the DRM task do not completely eliminate the false belief of remembering aspects of the lure's presentation (e.g. Gallo, Roberts, & Seamon, 1997; Neuschatz, Benoit, & Payne, 2003, Tkaczyk & Nieznański, 2013; for a discussion see Gallo, 2006). With respect to false attribution of specific contextual details to critical lures, Lampinen and colleagues (e.g. Lampinen et al., 2005; Lampinen, Ryals, & Smith, 2008) have called this process *content borrowing* because details from the presented items are "borrowed" at retrieval in order to corroborate the strong feeling of familiarity fomented by the critical lure. In the experiments mentioned above, using the think-out-loud procedure, Lampinen et al. (2005) found evidence of content borrowing in about half of the false remember responses. The content borrowing account suggests that retrieval mechanisms are responsible for this memory illusion, however, the binding of context characteristics to critical lure may as well occur during encoding.

The encoding-based over retrieval-based account is favoured by studies showing the source-strength effect, that is, the finding that the critical lure is most often remembered as presented in the context in which the words of the highest *backward associative strength* (BAS) to that critical lure were studied (Franks et al., 2016). In experiments on the source-strength effect, subsets of DRM lists differing in BAS are presented by different sources, for example, in the experiments of Hicks and Hancook (2002), DRM lists were presented by male and female speakers, where one speaker presented a list half of higher average BAS to the critical lure, whereas another source read half of the weak BAS. Critical lures were more often attributed to the speaker than the read items of strong BAS, that is, the items which more likely activated the critical lure during study (see also Hicks & Starns, 2006).

Recently, Franks et al. (2016), referring to Roediger and colleagues (Roediger, McDermott, Pisoni, & Gallo, 2004; Roediger et al., 2001) have called this encoding-based account a *misbinding-at-encoding account of illusory recollection*, and argued that highly activated items take on the contextual characteristics as a result of the misbinding of contextual details available at encoding to the activated critical lure. Franks et al. (2016), in their experiments using different locations on a computer screen as context information, confirmed the strength effect and, additionally, showed that medium-BAS items studied before the high-BAS items are capable of generating enough activation of a critical lure to produce the misbinding of contextual details. This effect of the order of study presentation would be difficult to explain solely on the basis of retrieval mechanisms.

Goals of the Present Study

In the present experiment, participants studied DRM lists with words presented in four different font colours. At the test, their task was to attribute the font colour to each test-item (a "don't know the colour" option was also available) or reject it as a new item. In order to influence context memory, we used two different encoding tasks, that is, reading words vs. generating words by completing a missing letter. In a series of experiments, it has been shown that such a generation task significantly decreases font colour memory in comparison with reading (e.g. Mulligan, 2004, 2011; Nieznański, 2011, 2012). Additionally, in order to manipulate the probability of context misbinding/borrowing, we presented DRM lists in blocked-colour vs. mixed-colour formats. The blocked-colour condition should result in a stronger tendency to attribute the list-colour to the critical lure than the mixed-colour condition (e.g. Mather et al., 1997; Roediger et al., 2004). Note that the encoding task and the presentation format variables both influence context memory, however, in a somewhat different manner, hence their effects will probably be additive. Blocked presentation should improve colour attribution due to the association of the gist (list-topic) with the colour of the studied list. In contrast, generation should rather influence an item-specific association between a word and its font-colour. A decrease in context memory for generated items is predicted on the basis of the resource trade-off hypothesis (see: Jurica & Shimamura, 1999; Nieznański, 2012) which assumes that the item generation task reduces resources required for episodic binding of a particular item with its context.

The independent variables manipulated in the experiment can increase false memory both through encoding and retrieval mechanisms. The former includes such factors as impoverishing relational encoding due to generation and increasing misbinding by reason of activation of the critical lure simultaneously with colour processing when all colours are blocked on the same list. Among the retrieval mechanisms are the heuristics of the rejection of items for which no memory of colour is retrieved, which should reduce false memory or mechanisms increasing false memory due to borrowing (guessing) the colour for highly familiar lures. Recently, Huff and Bodner (2013) have recommended signal detection analyses as a way to disentangle encoding from retrieval influences. The latter would rather affect the response criterion parameter, while the former are expected to influence the memory sensitivity parameter.

In sum, on the one hand, the read/blocked condition should result in more effective diagnostic monitoring than the generate condition because good memory for font colour makes the absence of colour memory for lures more diagnostic than in the generate/mixed condition. Moreover, reductions in false recognitions due to retrieval heuristics should be shown by a more conservative response criterion for critical lures (Gunter, Bodner, & Azad, 2007; Schacter et al., 1999). However, on the other hand, it can also be predicted that better context memory in the read/blocked condition should make content borrowing easier and/or context misbinding more probable, increasing false memory. Additional correlational analyses of the relationship between participants' context memory indices and item-specific/gist memory indices are planned in order to help in the interpretation of complex dependencies between variables.

Method

Participants

Ninety-six undergraduates agreed to participate in the experiment in exchange for course credits. All were recruited from a population of third-semester psychology students of Cardinal Stefan Wyszyński University in Warsaw, 22 of them were male. Participants were tested individually, and were assigned to experimental conditions in the order of entries – every fourth participant to one of the four groups.

Materials and Procedure

The stimuli used during the study phase consisted of 8 eight-word lists of lexical-semantic associates. Each of the lists were created in accordance with the DRM paradigm. We selected the critical lures that appeared to be most effective in the false-recall study by Tkaczyk and Nieznański (2013). Each list contained the most frequent associations to the lure word according to the Polish Word Association

Norms (Kurcz, 1967), with several constraints; we excluded words that appeared in more than one list; words that were derivates of already included words (e.g. *wooden, wood*); and words which were too short to use them in the generation task (e.g. *it*).The recognition memory test consisted of 48 words, 24 of which were targets, taken from the second, third, and seventh positions of the study DRM lists. Eight of the test items were critical lures corresponding to the DRM lists, while another 16 distractors were weak associates to critical lures, that is, words that were single reactions to the stimulus words according to the association norms. Using weakly related lures instead of unrelated lures may make the participants a bit more cautious at test (cf. Gunter, Ivanko, & Bodner, 2005).

The participants were tested individually on a personal computer. The presentation of stimuli materials and response recording were controlled using the E-Prime program 2.0 (Psychology Software Tools, Inc.). A 2 (encoding task: read, generate) x 2 (presentation format: blocked-colour, mixed-colour) factorial design was used, with 24 participants assigned to each group. The order of the 8 DRM lists was not randomised, and words on the lists were always presented in the same order, with the strongest associates occurring first. The lists were separated by an asterisk in black font. All the items were presented on a computer screen at the rate of 3 seconds. Each participant was instructed to read words to oneself and try to remember them as well as their font colours. The participants were also told that the words are grouped in 8 lists with 8 items each.

In the generate condition, one letter was missing in the target word and replaced by an underscore mark. Almost in all cases the missing letter was a vowel, it was never the first letter of the word, and it was possible to generate only one sensible solution for each target[1]. Four font colours were used: blue, green, yellow, and red. In the blocked-colour presentation format, all eight words composing a DRM list were presented in the same font colour, each colour was used for two lists, and the colour was repeated after the presentation of the three lists of different colours. In the mixed-colour presentation format, all four colours were used for words composing a DRM list. Each colour was used for two words; the colour was repeated after the presentation of three words of different colours. Four versions of study lists were prepared so that each DRM list (or each item on a list) was presented in one of the four font colours to an equal number of participants. At test, words were presented in random order, in black font, and participants were instructed to choose one of the six response options: "new", "green", "red", "yellow", "blue", and "old but I don't know what colour it was".

[1] In our previous experiment with a similar generation task, we found it a very easy task for undergraduate students (we observed 0% of failures for high-frequency words and 5.5% of failures for low-frequency words, Nieznański, 2014), therefore, we neglected the control of the generation success in the current study.

Results

Colour Attributions

As a measure of the correct colour identification for targets we used the Conditional Source Identification Measure, CSIM (e.g. Bayen, Nakamura, Dupuis, & Yang, 2000; Murnane & Bayen, 1996), which is the proportion of the number of correct colour attributions to the number of correct recognitions as "old" (see Table 1). An ANOVA with the type of encoding task and presentation format as independent variables revealed the significant main effects of the encoding task, $F(1, 92) = 7.43$, $MSE = 0.30$, $p = .008$, $\eta_p^2 = 0.08$, as well as of the presentation format, $F(1, 92) = 16.94$, $MSE = 0.69$, $p < .001$, $\eta_p^2 = 0.16$, and no interaction between the two, $F(1, 92) = 1.11$, $MSE = 0.04$, *ns*.

When colours were blocked during study, the participants often attributed the colour of the list to its corresponding critical lure. Indices of colour attributions to critical lures conditionalized on their recognitions as old are shown in Table 1. Mean proportions of list-colour attributions were nonsignificantly higher in the read than in the generate condition, $t(46) = 1.67$, $p = .10$. Overall, in the read and generate conditions, the probability of choosing the list-colour for the critical lure was 0.51, which was more than twice higher than the value of 0.20, the probability of choosing one of the five response options (green, red, yellow, blue, don't know), if each option is equally probable. The participants rarely chose the "don't know the colour" response option, however, the significant main effect of the presentation format was revealed $F(1, 92) = 6.25$, $MSE = 0.13$, $p < .02$, $\eta_p^2 = 0.06$, with no effect of the encoding task, $F(1, 92) = 0.80$, $MSE = 0.02$, *ns*, and no interaction, $F(1, 92) = 1.15$, $MSE = 0.02$, *ns*.

Table 1

Mean (SD) Proportions of Correct Colour Identifications of Recognized Targets and Mean (SD) Proportions of List-Colour Attributions and "Don't Know the Colour" Responses to Critical Lures

	Read		Generated	
	Mixed	Blocked	Mixed	Blocked
Targets colour	0.39 (0.152)	0.60 (0.217)	0.32 (0.161)	0.45 (0.258)
Critical lures – list colour	-	0.58 (0.308)	-	0.44 (0.258)
Critical lures – "don't know the colour"	0.16 (0.171)	0.06 (0.090)	0.10 (0.150)	0.06 (0.147)

Hit and False Alarm Rates

Table 2 presents the mean proportions of "old" responses[2] for particular types of test-items across experimental conditions. A 2 (encoding task) x 2 (presentation format) analysis of variance (ANOVA) on the hit rate (HR) revealed a significant main effect of the encoding task condition for targets, $F(1, 92) = 7.73$, $MSE = 0.12$, $p = .007$, $\eta_p^2 = 0.08$, a marginally significant effect of the presentation format, $F(1, 92) = 3.86$, $MSE = 0.06$, $p = .05$, $\eta_p^2 = 0.04$, and no interaction between the two, $F(1, 92) = 0.07$, $MSE = 0.001$, *ns*.

The analyses of the false alarms rates (FAR) to critical lures and weakly-related lures yielded no significant effect. In detail, for critical lures, there was no evidence for a main effect of the encoding task, $F(1, 92) = 0.22$, $MSE = 0.01$, *ns*, and the presentation format, $F(1, 92) = 1.37$, $MSE = 0.06$, *ns*, nor for an interaction, $F(1, 92) = 0.22$, $MSE = 0.01$, *ns*. Similarly, for weak lures, there was no evidence for a main effect of the encoding task, $F(1, 92) = 0.48$, $MSE = 0.01$, *ns*, and the presentation format, $F(1, 92) = 0.94$, $MSE = 0.02$, *ns*, nor for an interaction, $F(1, 92) = 0.02$, $MSE = 0.000$, *ns*.

Table 2

Mean (SD) Proportions of "Old" Responses for Item Types across Experimental Conditions

	Read		Generated	
Item type	Mixed	Blocked	Mixed	Blocked
Targets	0.80 (0.120)	0.86 (0.106)	0.74 (0.143)	0.78 (0.130)
Critical lures	0.63 (0.215)	0.71 (0.238)	0.63 (0.221)	0.67 (0.197)
Weak lures	0.14 (0.113)	0.12 (0.130)	0.17 (0.137)	0.13 (0.165)

Signal-Detection Indices of Sensitivity and Response Bias

To identify the contributions of sensitivity and response strategy to participants' performance, we conducted signal detection analyses. As an estimate of memory sensitivity, we used d', $z(\text{HR}) - z(\text{FAR})$; as an estimate of the position of the decision criterion, we used *lambda index* (λ, Wickens, 2002). It captures the response bias in relation to noise distribution only, $z(1 - \text{FAR})$; thus, it does not depend on the HR, which makes it preferable over other popular estimates when we expect the influence of the encoding task on HR (Gunter et al., 2007). Higher λ values indicate more conservative responding. We adjusted the HRs of 1.0 and the FARs of 0 using $1 - 1/2n$ and $1/2n$ correction, respectively (e.g. Macmillan & Kaplan, 1985).

Following Koutstaal and Schacter (1997) and other researchers (e.g. Schacter et al., 1999; Van Damme, 2013), we calculated the sensitivity and response indices in

[2] We treated all colour attributions and "don't know the colour" responses as "old" responses.

three ways. First, we investigated *item-specific memory* (ISM-1) by comparing HR to list targets against FAR to weak lures. Second, we calculated another pair of signal detection indices for *item-specific memory* (ISM-2) by comparing HR to list targets against FAR to critical lures. Finally, we analysed the degree to which participants rely on *gist memory* (GM), thus, we treated "old" responses to critical lures as hits and compared their rate against FAR to weak lures. Table 3 presents the signal-detection indices for item-specific memory as well as gist memory across experimental conditions.

Table 3

Estimates of Sensitivity (d') and Response Criterion (λ) as a Function of Study Condition

		Read		Generated	
		Mixed	Blocked	Mixed	Blocked
Item-specific memory 1	*d'*	2.09 (0.536)	2.48 (0.676)	1.78 (0.606)	2.10 (0.663)
	λ	1.15 (0.493)	1.30 (0.536)	1.08 (0.539)	1.25 (0.655)
Item-specific memory 2	*d'*	0.55 (0.586)	0.54 (0.619)	0.30 (0.594)	0.35 (0.607)
	λ	-0.38 (0.627)	-0.63 (0.716)	-0.40 (0.640)	-0.50 (0.588)
Gist memory	*d'*	1.54 (0.417)	1.94 (0.883)	1.48 (0.608)	1.75 (0.734)

Note: Item-specific memory 1 = hits compared to weak lures false alarms; Item-specific memory 2 = hits compared to critical lures false alarms; Gist memory = critical items false alarms treated as hits and compared to weak lures false alarms. Standard deviations of the mean are given in parentheses. *Lambda* index for Gist memory is the same as for Item-specific memory 1.

For the distinction between targets and weak lures (ISM-1), we performed a 2 (encoding task) x 2 (presentation format) ANOVA on *d'*, which revealed a significant main effect of the encoding task, $F(1, 92) = 7.36$, $MSE = 2.85$, $p = .008$, $\eta_p^2 = 0.07$, as well as a significant effect of the presentation format, $F(1, 92) = 7.99$, $MSE = 3.10$, $p = .006$, $\eta_p^2 = 0.08$, but no effect of interaction, $F(1, 92) = 0.07$, $MSE = 0.03$, *ns*. For sensitivity measures of distinguishing list targets from critical lures (ISM-2), ANOVA revealed a marginal main effect of the encoding task, $F(1, 92) = 3.27$, $MSE = 1.18$, $p = .07$, $\eta_p^2 = 0.03$, and no effect of the presentation format, $F(1, 92) = 0.04$, $MSE = 0.01$, *ns*, and no interaction, $F(1, 92) = 0.06$, $MSE = 0.02$, *ns*. For gist memory (GM), the analysis yielded no effect of the encoding task, $F(1, 92) = 0.78$, $MSE = 0.36$, *ns*, but the main effect of the presentation format was significant, $F(1, 92) = 5.76$, $MSE = 2.68$, $p = .02$, $\eta_p^2 = 0.06$, with no interaction between the two, $F(1, 92) = 0.22$, $MSE = 0.10$, *ns*.

Analyses for the λ index for memory monitoring of weak lures, revealed no significant effect of the encoding task, $F(1, 92) = 0.31$, $MSE = 0.10$, *ns*, the presentation format, $F(1, 92) = 1.99$, $MSE = 0.62$, *ns*, nor of interaction, $F(1, 92) = 0.01$, $MSE = 0.004$, *ns*. Similarly, analyses for the λ index for the memory monitoring of critical lures also yielded no significant effect for the encoding task, $F(1, 92) =$

0.20, *MSE* = 0.08, *ns*, the presentation format, $F(1, 92) = 1.73$, *MSE* = 0.72, *ns*, nor for interaction, $F(1, 92) = 0.36$, *MSE* = 0.15, *ns*.

Relations between Colour Attribution and Item-Specific/Gist Memory

The correlational analyses shown in Table 4 indicate that both in the read and generate conditions, the more the participants were prone to attribute the list-colour to the critical lure, the more liberal was their response criterion when they differentiated between targets and critical lures (ISM-2), as indicated by the negative Spearman's *rho* correlations. In contrast, in the read/blocked condition, better colour identification for targets was moderately correlated with a more conservative response criterion when targets are differentiated from weak lures (ISM-1/GM). The analyses also showed a strong or moderate positive correlation between memory sensitivity parameters (for ISM-1 and GM) and colour identification index for targets, in the blocked-read condition.

Table 4

Spearman's Rho Rank Order Correlations among Colour Attribution Measures and Sensitivity and Response Criterion Measures

		Memory sensitivity *d'*			Response criterion λ	
Encoding condition	Colour identification	ISM-1	ISM-2	GM	ISM-1/ GM	ISM-2
Blocked Read	Targets colour	**.70**[a]	-.08	**.53**[b]	**.53**[b]	-.26
	Critical lures colour	**.77**[a]	-.27	**.71**[a]	**.58**[b]	**-.46**[c]
Blocked Generate	Targets colour	**.47**[c]	.00	.32	.10	-.30
	Critical lures colour	.26	-.09	.17	-.16	**-.45**[c]
Mixed Read	Targets colour	.30	.36	-.15	.02	.13
Mixed Generate	Targets colour	.24	.31	-.16	.11	.15

Significant correlations are indicated in bold font, [a] $p < .001$; [b] $p < .01$; [c] $p < .05$.

Discussion

In our experiment we examined the influence of context memory on the false recognition of critical lures in the DRM paradigm. Although we demonstrated that both the presentation format and the encoding task influence context memory, we did not confirm the expected influence of these variables on false alarm rates for critical lures. Nevertheless, some interesting results were revealed for illusory context recollections and their relationships with the signal detection indices of item-specific and gist memory.

Our manipulations of the encoding task and the presentation format effectively influenced memory for context. As expected, the font colour was significantly worse identified in the generate than the read condition (e.g. Mulligan, 2004, 2011; Nieznański, 2011, 2012). Moreover, it seems that context memory was reflected in recognition memory performance analyses, for which all colour attributions and "don't know the colour" responses were treated as "old" responses. The type of encoding task affected the memory sensitivity parameter when hits for targets were compared against false alarms to weak lures – the read condition resulted in higher *d'* than the generate condition. On the face of it, this result is at odds with the generation effect (Slamecka & Graf, 1978) – a robust phenomenon described in recognition memory literature (for a meta-analysis, see Bertsch, Pesta, Wiscott, & McDaniel, 2007). However, it should be noted that the generation effect in recognition memory was usually examined in studies using an *old/new* response format. In our study, the participants received a source-monitoring test which was not preceded by *old/new* recognitions – they were just asked to choose among: "green", "red", "yellow", "blue", "don't know the colour", and "new" response options. The negative generation effect observed for item-specific memory sensitivity (ISM-1) suggests that the participants were focused on context recollection and preferred to respond "new" for familiar items for which they did not remember their colour instead of choosing the "don't know" option. In consequence, the expected positive influence of generation on item memory was not captured by our testing procedure. The connection between context memory and item memory test performance was confirmed by correlational analyses which showed a positive relationship between the index of correct colour identification and the *d'* parameter value, at least in the blocked presentation condition.

Our second experimental manipulation, the presentation format, also confirmed its influence on context memory. As expected, blocked-colour presentation resulted in better colour identification than mixed presentation. As in the case of the read condition, the blocked presentation format also resulted in higher item-specific memory sensitivity (ISM-1). Moreover, the blocked presentation condition led to higher gist memory sensitivity than the mixed format condition. Therefore, presenting words that share the gist in the same colour significantly enhanced their relational encoding. This result supports a misbinding-at-encoding account of illusory recollection (e.g. Franks et al., 2016). It appears that the critical lure activated during study is misbound to the context accompanying the presentation of words that are associated to that critical lure.

We did not confirm the influence of better colour memory in the read condition on gist memory; it is possible that this condition is not sufficient to lead to misbinding effects, alternatively, context memory effects could be masked by the direct effect of an encoding task on false memory. However, the reports from literature concerning the influence of the generation task on false memory are not conclusive (see Soraci, Carlin, Toglia, Chechile, & Neuschatz, 2003, for the null effect of generation on false alarms). Some researchers suggested that generation – as a distinctive form of item processing – may reduce false memory due to increased monitoring at test or decreased relational processing at encoding (Gunter et al., 2007; Huff & Bodner, 2013). If this was true in our study, gist memory should be increased in the read in comparison with the generate condition – no such effect was detected.

In the case of discrimination between targets and critical lures, item-specific memory sensitivity (ISM-2) was revealed to be very poor (*d'* values ranged from 0.30 to 0.55) and was only marginally better in the read than generate condition. However, correlational analyses showed an interesting pattern of results. In the blocked presentation format, a proneness to attribute the list-colour to the critical lure was related to a liberal response bias for critical lures, both in the read and generate conditions. In contrast, participants with better colour identification for targets scores and those who were more prone to attribute list-colour to the critical lure were also more conservative in responding to weak lures (in the blocked/read condition). These results implicate the important role of retrieval mechanisms for illusory context recollection; it seems that participants who remember the list-colour well, readily "borrow" this attribute to critical lures and reject weak lures. This result supports content borrowing at retrieval account (e.g. Lampinen et al., 2005, 2008).

In the concluding comments, we refer our results to the main theoretical accounts of false memory mentioned in the introduction. According to the fuzzy-trace theory, false memories occur primarily because critical lures acceptance is supported by the retrieval of gist memories of targets. The more close in meaning are the targets and critical lures, the more probable it is that lure presentation will elicit gist memory (e.g. Brainerd & Reyna, 1998, 2002ab; Brainerd et al., 1995, 1999, cf. Nieznański & Tkaczyk, 2017). Moreover, the levels of false memory are high following blocked presentation of related words because of a strong tendency to reconstructively process the lists essence (Brainerd & Reyna, 2002a). Strong gist memories based on the repeated presentation of lure-related targets lead to phantom recollection. As recently suggested by Nieznański and Tkaczyk (2017), content borrowing may be interpreted as a retrieval process that supports phantom recollection. In their Experiment 1, the participants studied DRM lists along with pictorial context that was switched or reinstated at the memory test. Data analysis based on the multinomial modelling approach showed that the phantom recollection parameter was significantly reduced in the switched-context condition in comparison with the reinstated-context condition. It seems that the illusory recollection of context was enhanced when the participants expected that all the targets were presented with the same context, this is what probably also took place in the blocked presentation condition in the current experiment. In a way, the participants mentally reinstated the study context when they expected that all the words associated with the particular gist were presented in the same colour. However, the prerequisite of false colour attribution to non-presented but gist-related lures is disintegration of traces whose fragments may become associated with the wrong context (Reyna & Lloyd, 1997).

From the perspective of the activation-monitoring account (Roediger et al., 2001) it can be predicted that better source monitoring will lead to the reduction of false recognitions of critical lures because accurate reality monitoring (which is a special case of source monitoring, Johnson et al., 1993) results in critical lure identification as self-generated during encoding. However, in our experiment, conditions leading to better source monitoring had no effect on false alarm rates for critical lures. Using signal detection analyses we only observed a marginal effect of the encoding task on distinguishing list targets from critical lures (ISM-2). We also found no significant correlations between ISM-2 sensitivity or response bias index and colour memory for targets. Therefore, our results showed no evidence for effective diagnostic monitoring of critical lures due to manipulations increasing context memory.

However, we found some interesting effects concerning the illusory recollection of context which were probably mediated both by encoding and retrieval mechanisms. We derived this conclusion from signal detection analyses and the assumption that retrieval factors affect the response criterion parameter, whereas the encoding processes influence the memory sensitivity parameter (Huff & Bodner, 2013). The effect of encoding mechanisms was indicated by a higher gist memory sensitivity in the blocked-context presentation format than in the mixed-context presentation format and significant positive correlation between gist sensitivity parameter and context recollection in the read/blocked condition. The latter result can be accommodated by the activation-monitoring theory, when we assume that contextual information that belongs to list items may be encoded as a feature of the self-generated item (cf. O'Neil & Diana, 2017), such a phenomenon can be described as misbinding (Franks et al., 2016).

The role of retrieval mechanisms was documented in the blocked/read condition, by the observation that participants who are more prone for illusory recollection of the font colour also more liberally respond to critical lures, this may reflect the mechanism of content borrowing (Lampinen et al., 2005, 2008). This observation is generally consistent with predictions of the global-matching models. These models assume that critical lure presentation at test results in partial activation of multiple encoded memory traces basing upon their similarity to the memory probe. The activation of traces in memory is then summed and is greater when both item and contextual information match with the memory probe. According to the global-matching models, context details for critical lures may be compiled during retrieval from an entire set of traces (cf. Arndt, 2015; Hicks & Starns, 2006). In the blocked condition, all the list items related to the particular critical lure share the same colour, and this makes context borrowing more probable than in the condition with multiple colours associated with a DRM list.

The question about the mechanisms of context misattribution to critical lures seems to be crucial for a full understanding of the phenomenon of false memory. Our results showed that the two conditions leading to the best context memory did not increase correct rejections of distractors that are semantically related to studied items. Instead, when the gist of the list of blocked words was connected with the same context, the participants were prone to attribute (or bind) this context to the gist-consistent distractor. Our analyses using signal-detection parameters of memory sensitivity and response bias suggested that illusory recollection of context can be fomented through both encoding- and retrieval-mechanisms, however, these observations were mostly supported by correlational analyses, so this issue needs further empirical investigation.

References

Arndt, J. (2015). The influence of forward and backward associative strength on false memories for encoding context. *Memory, 23,* 1093-1111. doi:10.1080/09658211.2014.959527

Arndt, J., & Gould, C. (2006). An examination of two-process theories of false recognition. *Memory, 14,* 814-833. doi:10.1080/09658210600680749

Bayen, U. J., Nakamura, G. V., Dupuis, S. E., & Yang, C.-L. (2000). The use of schematic knowledge about sources in source monitoring. *Memory & Cognition, 28,* 480-500. doi:10.3758/BF03198562

Bertsch, S., Pesta, B. J., Wiscott, R., & McDaniel, M. A. (2007). The generation effect: A meta-analytic review. *Memory & Cognition, 35,* 201-210. doi:10.3758/BF03193441

Brainerd, C. J., & Reyna, V. F. (1998). When things that were never experienced are easier to "remember" than things that were. *Psychological Science, 9,* 484-489. doi:10.1111/1467-9280.00089

Brainerd, C. J., & Reyna, V. F. (2002a). Fuzzy-trace theory: Dual processes in memory, reasoning, and cognitive neuroscience. *Advances in Child Development and Behavior, 28,* 49-100. doi:10.1016/s0065-2407(02)80062-3

Brainerd, C. J., & Reyna, V. F. (2002b). Fuzzy-trace theory and false memory. *Current Directions in Psychological Science, 11,* 164-169. doi:10.1111/1467-8721.00192

Brainerd, C. J., Reyna, V. F., & Kneer, R. (1995). False-recognition reversal: When similarity is distinctive. *Journal of Memory and Language, 34,* 157-185. doi:10.1006/jmla.1995.1008

Brainerd, C. J., Reyna, V. F., & Mojardin, A. H. (1999). Conjoint recognition. *Psychological Review, 106,* 160-179. doi:10.1037/0033-295x.106.1.160

Bruce, D., Phillips-Grant, K., Conrad, N., & Bona, S. (2004). Encoding context and false recognition memories. *Memory, 12,* 562-570. doi:10.1080/09658210344000107

Carmichael, A. M., & Gutchess, A. H. (2016). Using warnings to reduce categorical false memories in younger and older adults. *Memory, 24,* 853-863. doi:10.1080/09658211.2015.1059454

Deese, J. (1959). On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology, 58,* 17-22. doi:10.1037/h0046671

Dodson, C. S., Koutstaal, W., & Schacter, D. L. (2000). Escape from illusion: Reducing false memories. *Trends in Cognitive Sciences, 4,* 391-397. doi:10.1016/s1364-6613(00) 01534-5

Dodson, C. S., & Schacter, D. L. (2001). "If I had said it I would have remembered it": Reducing false memories with a distinctiveness heuristic. *Psychonomic Bulletin and Review, 8,* 155-161. doi:10.3758/bf03196152

Franks, B. A., Butler, K. M., & Bishop, J. (2016). The effects of study order and backward associative strength on illusory recollection: A source-strength effect does not always occur. *Memory, 24,* 154-164. doi:10.1080/09658211.2014.994641

Gallo, D. A. (2006). *Associative illusions of memory: False memory research in DRM and related tasks*. New York, NY: Psychology Press. doi:10.4324/9780203782934

Gallo, D. A., Roberts, M. J., & Seamon, J. G. (1997). Remembering words not presented in lists: Can we avoid creating false memories? *Psychonomic Bulletin & Review, 4,* 271-276. doi:10.3758/bf03209405

Gunter, R. W., Bodner, G. E., & Azad, T. (2007). Generation and mnemonic encoding induce a mirror effect in the DRM paradigm. *Memory & Cognition, 35,* 1083-1092. doi:10.3758/bf03193480

Gunter, R. W., Ivanko, S. L., & Bodner, G. E. (2005). Can test list context manipulations improve recognition accuracy in the DRM paradigm? *Memory, 13,* 862-873. doi:10.1080/09658210444000458

Hicks, J. L., & Hancock, T. W. (2002). Backward associative strength determines source attributions given to false memories. *Psychonomic Bulletin & Review, 9,* 807-815. doi:10.3758/bf03196339

Hicks, J. L., & Marsh, R. L. (1999). Attempts to reduce the incidence of false recall with source monitoring. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 25,* 1195-1209. doi:10.1037/0278-7393.25.5.1195

Hicks, J. L., & Marsh, R. L. (2001). False recognition occurs more frequently during source identification than during old-new recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 27,* 375-383. doi:10.1037/0278-7393.27.2.375

Hicks, J. L., & Starns, J. J. (2006). The roles of associative strength and source memorability in the contextualization of false memories. *Journal of Memory and Language, 54,* 39-53. doi:10.1016/j.jml.2005.09.004

Huff, M. J., & Bodner, G. E. (2013). When does memory monitoring succeed versus fail? Comparing item-specific and relational encoding in the DRM paradigm. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 39,* 1246-1256. doi:10.1037/a0031338

Hunt, R. R. (2003). Two contributions of distinctive processing to accurate memory. *Journal of Memory and Language, 48,* 811-825. doi:10.1016/s0749-596x(03)00018-4

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin, 114*, 3-28. doi:10.1037/0033-2909.114.1.3

Jurica, P. J., & Shimamura, A. P. (1999). Monitoring item and source information: Evidence for a negative generation effect in source memory. *Memory & Cognition, 27*, 648-656. doi:10.3758/bf03211558

Koutstaal, W., & Schacter, D. L. (1997). Gist-based false recognition of pictures in older and younger adults. *Journal of Memory & Language, 37*, 555-583. doi:10.1006/jmla.1997.2529

Kurcz, I. (1967). Polskie normy powszechności skojarzeń swobodnych na 100 słów z listy Kent-Rosanoffa [Polish norms for free associations to 100 words from Kent-Rosanoff list]. *Studia Psychologiczne, 8*, 122-255.

Lampinen, J. M., Meier, C. R., Arnal, J. D., & Leding, J. K. (2005). Compelling untruths: Content borrowing and vivid false memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 31*, 954-963. doi:10.1037/0278-7393.31.5.954

Lampinen, J. M., Ryals, D. B., & Smith, K. (2008). Compelling untruths: The effect of retention interval on content borrowing and vivid false memories. *Memory, 16*, 149-156. doi:10.1080/09658210701839277

Macmillan, N. A., & Kaplan, H. L. (1985). Detection theory analysis of group data: Estimating sensitivity from average hit and false-alarm rates. *Psychological Bulletin, 98*, 185-199. doi:10.1037/0033-2909.98.1.185

Mather, M., Henkel, L. A., & Johnson, M. K. (1997). Evaluating characteristics of false memories: Remember/know judgments and memory characteristics questionnaire compared. *Memory & Cognition, 25*, 826-837. doi:10.3758/bf03211327

McCabe, D. P., Presmanes, A. G., Robertson, C. L., & Smith, A. D. (2004). Item-specific processing reduces false memories. *Psychonomic Bulletin & Review, 11*, 1074-1079. doi:10.3758/bf03196739

Mulligan, N. W. (2004). Generation and memory for contextual detail. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 30*, 838-855. doi:10.1037/0278-7393.30.4.838

Mulligan, N. W. (2011). Generation disrupts memory for intrinsic context but not extrinsic context. *Quarterly Journal of Experimental Psychology, 64*, 1543-1562. doi:10.1080/17470218.2011.562980

Murnane, K., & Bayen, U. J. (1996). An evaluation of empirical measures of source identification. *Memory & Cognition, 24*, 417-428. doi:10.3758/bf03200931

Neuschatz, J. S., Benoit, G. E., & Payne, D. G. (2003). Effective warning in the Deese-Roediger-McDermott false-memory paradigm: The role of identifiability. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 29*, 35-41. doi:10.1037/0278-7393.29.1.35

Nieznański, M. (2011). Generation difficulty and memory for source. *Quarterly Journal of Experimental Psychology, 64*, 1593-1608. doi:10.1080/17470218.2011.566620

Nieznański, M. (2012). Effects of generation on source memory: A test of the resource trade-off versus processing hypothesis. *Journal of Cognitive Psychology, 24,* 765-780. doi:10.1080/20445911.2012.690555

Nieznański, M. (2014). The role of reinstating generation operations in recognition memory and reality monitoring. *Polish Psychological Bulletin, 45,* 363-371. doi:10.2478/ppb-2014-0044.

Nieznański, M., & Tkaczyk, D. (2017). Effects of pictorial context reinstatement on correct and false recognition memory: Insights from the simplified conjoint recognition paradigm. *Journal of Cognitive Psychology, 29*, 866-881. doi:10.1080/20445911.2017.1317264

O'Neill, M., & Diana, R. A. (2017). The neurocognitive basis of borrowed context information. *Cortex, 91,* 89-100. doi:10.1016/j.cortex.2017.01.014

Reyna, V. F., & Lloyd, F. (1997). Theories of false memory in children and adults. *Learning and Individual Differences, 9,* 95-123. doi:10.1016/s1041-6080(97)90002-9

Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*, 803-814. doi:10.1037/0278-7393.21.4.803

Roediger, H. L., McDermott, K. B., Pisoni, D. B., & Gallo, D. A. (2004). Illusory recollection of voices. *Memory, 12*, 586-602. doi:10.1080/09658210344000125

Roediger, H. L., Watson, J. M., McDermott, K. B., & Gallo, D. A. (2001). Factors that determine false recall: A multiple regression analysis. *Psychonomic Bulletin & Review, 8,* 385-407. doi:10.3758/bf03196177

Schacter, D. L., Israel, L., & Racine, C. (1999). Suppressing false recognition in younger and older adults: The distinctiveness heuristic. *Journal of Memory and Language, 40*, 1-24. doi:10.1006/jmla.1998.2611

Slamecka, N. J., & Graf, P. (1978). The generation effect: Delineation of a phenomenon. *Journal of Experimental Psychology: Human Learning and Memory, 4*, 592-604. doi:10.1037/0278-7393.4.6.592

Soraci, S. A., Carlin, M. T., Toglia, M. P., Chechile, R. A., & Neuschatz, J. S. (2003). Generative processing and false memories: When there is no cost. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 29*, 511-523. doi:10.1037/0278-7393.29.4.511

Tkaczyk, D., & Nieznański, M. (2013). Sprawność pamięci roboczej a podatność na fałszywe wspomnienia w zadaniu Deese'a-Roedigera-McDermott [Working memory capacity and susceptibility to false memory in the Deese-Roediger-McDermott paradigm]. *Przegląd Psychologiczny, 56*, 491-506.

Unsworth, N., & Brewer, G. A. (2010). Individual differences in false recall: A latent variable analysis. *Journal of Memory and Language, 62*, 19-34. doi:10.1016/j.jml.2009.08.002

Van Damme, I. (2013). Mood and the DRM paradigm: An investigation of the effects of valence and arousal on false memory. *Quarterly Journal of Experimental Psychology, 66,* 1060-1081. doi:10.1080/17470218.2012.727837

Wickens, T. D. (2002). *Elementary signal detection theory*. Oxford: Oxford University Press. doi:10.1093/acprof:oso/9780195092509.001.0001

Kontekstualno pamćenje i pogrešno prepoznavanje kod Deese/Roediger-McDermott paradigme: Uloga mehanizama kodiranja i pronalaženja

Sažetak

Ispitali smo ulogu kontekstualnog pamćenja kod pogrešnog prepoznavanja kritičnih riječi mamaca i iluzornog pamćenja konteksta kod Deese/Roediger-McDermott paradigme. S ciljem manipulacije kontekstualnog pamćenja za boje ispitanici su čitali ili generirali riječi tijekom učenja. Prezentirali smo riječi s pojedinih lista u obliku blokova ili u mješovitom obliku s obzirom na boju riječi. Kod obje se manipulacije pojavio efekt konteksta na prepoznavanje boje. Pomoću analize temeljene na teoriji detekcije signala procijenili smo parametre osjetljivosti i pristranosti odgovaranja, uz pretpostavku da osjetljivost odražava efekt mehanizama kodiranja, a pristranost odgovaranja odražava efekt mehanizama pronalaženja informacija. Rezultati nisu pokazali evidenciju za dijagnostičko nadgledanje, odnosno, ispitanici se nisu koristili izostankom dosjećanja boja kao strategijom pronalaženja za odbacivanje riječi mamce. Međutim, u uvjetu lista prezentiranih u obliku blokova s obzirom na boju, bolje pamćenje za boju riječi s liste bilo je povezano s boljim pamćenjem biti i većom sklonošću pripisivanju boje riječi s liste riječima mamcima. Dobivene smo rezultate interpretirali kao posljedicu "pogrešnog vezivanja" kontekstualnih detalja s aktiviranim riječima mamcima tijekom kodiranja i/ili "posuđivanju" tih detalja tijekom pronalaženja.

Ključne riječi: DRM paradigma, kontekstualno pamćenje, pogrešno prepoznavanje, iluzorno pamćenje

Memoria contextual y memoria falsa de señuelos críticos en el paradigma de Deese/Roediger-McDermott: Papel de mecanismos de codificación y recuperación de datos

Resumen

Examinamos el papel que la memoria contextual tiene en el reconocimiento falso de señuelos críticos y en el recuerdo ilusorio del contexto en el paradigma de Deese/Roediger-McDermott. Para manipular la memoria contextual, les pedimos a los participantes que leyeran vs. generaran artículos durante el estudio y les presentamos artículos de una lista usando formatos de colores bloqueados o mezclados. Las dos manipulaciones confirmaron su influencia en la identificación del color. Usando análisis de detección de señales, verificamos la sensibilidad de la memoria y los parámetros del sesgo de respuesta, suponiendo que la primera reflejaba influencias de mecanismo de codificación, mientras que este último reflejaba efectos de mecanismo basado en la recuperación. Nuestros resultados no mostraron ninguna prueba de monitorización del diagnóstico, o sea, los participantes no usaron fallo de recuerdo del color como estrategia de recuperación para el rechazo de señuelos. Sin embargo, también mostramos que, en la condición del color bloqueado, mejor recuerdo del color se relacionaba con mejor memoria esencial y mayor propensión a atribuir el color de la lista al señuelo crítico correspondiente. Interpretamos estos resultados como indicativos, o sea, que los participantes "confundieron" detalles contextuales con los señuelos críticos activados en la codificación y/o "tomaron prestados" estos detalles en la recuperación para corroborar la familiaridad fuerte de los señuelos críticos.

Palabras clave: paradigma DRM, memoria contextual, reconocimiento falso, recuerdo ilusorio

Primljeno: 31.05.2017.