Consciousness and Cognition 20 (2011) 828–839

Contents lists available at ScienceDirect

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

Conscious and unconscious discriminations between true and false memories

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ARTICLE INFO

Article history:
Received 13 July 2010
Available online 20 November 2010

Keywords:
Recognition memory
DRM paradigm
False memory
Signal detection theory
Unconscious discrimination
Criterion and sensitivity
Confidence rating
Remember-know judgment

ABSTRACT

When subjects give higher confidence or memory ratings to a test word in a recognition test, do they simply raise their criterion without making better discrimination, or do they raise both criterion and true discrimination between the studied words (SW) and the lures? Given that previous studies found subjects' false alarm responses to lures slower than to SW, and recognition latency inversely correlated with the confidence rating, can the latency difference between the lures and SW be accounted for by confidence or memory ratings? The present results showed that when subjects gave higher confidence or memory ratings, both their bias and sensitivity were raised, indicating that they could consciously distinguish the lures from the SW. However, a latency difference between true and false recognitions persisted after confidence and memory ratings were held constant, suggesting an unconscious source of discrimination between the two types of memory.

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1. Introduction

Roediger and McDermott (1995) revived and extended a memory research paradigm first developed by Deese (1959), which is now known as the Deese–Roediger–McDermott (DRM) paradigm. In this paradigm, participants are presented with a list of semantically associated words, such as *bed*, *rest*, *awake*, *tired*, *dream*, etc. except the thematic word *sleep*, i.e., the critical nonpresented word (CNPW), and are later tested on their recall and/or recognition memory of both the CNPW and the studied list words (SW). A very robust phenomenon found across numerous studies is that participants have a strong tendency to recall the CNPW or make a false positive identification of the CNPW. The false recall or recognition rate is comparable to that of an average studied word (McDermott, 1996; Roediger & McDermott, 1995). Subjects in the DRM paradigm experiments typically report vivid or distinctive recollections of having seen or heard "certain details" of the CNPW (Gallo, McDermott, Percer, & Roediger, 2001; Lampinen, Neuschatz, & Payne, 1999; Payne, Elie, Blackwell, & Neuschatz, 1996; Roediger & McDermott, 1995). For example, they sometimes claimed which of the two or more speakers said the CNPW when the list words were presented by more than one speaker (Lampinen et al., 1999; Payne et al., 1996), and they sometimes felt even more confident about studying the CNPW than the words they actually studied (Toglia, Neuschatz, & Goodwin, 1999). Because of this reason, Brainerd, Wright, Reyna, and Mojardin (2001) referred to this subjective, vivid experience as a phantom recollection, and Roediger (1996) called it a memory illusion. These findings highlight the vivid, realistic aspects of the experiences that subjects often report having, and the dramatic indistinguishability of the false memory from true memory.

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1053-8100/$ - see front matter Published by Elsevier Inc.
doi:10.1016/j.concog.2010.10.022

The present study examined the other side of the facts about the false memory.[1] Namely, is there evidence that subjects may actually be able to discriminate the two types of memories both consciously and unconsciously, not in the sense that they stop making false alarms to the CNPW, but that they demonstrate knowledge, explicitly or implicitly, that the false alarm "old" and the hit old responses are different? That subjects call both the SW and CNPW "old" may not necessarily mean that their experiences with the two types of words are exactly the same. The first question asked in this study is whether subjects have any *conscious awareness* of the difference between their true and false memories. Although the main focus of the study is to determine if false memory can be unconsciously discriminated from true memory, any capability of discriminating the two types of memories must first be tested to see if it can be accounted for in terms of conscious processes before it can be attributed to an unconscious source or process.

Jou, Matus, Aldridge, Rogers, and Zimmerman (2004) showed that overall, true recognition memory was assigned higher confidence ratings than false recognition memory. On the face of it, this seemed to be an indication of subjects' being conscious of the distinction between the two types of memories. However, from the perspective of the signal detection theory (SDT) (Green & Swets, 1966; Macmillan & Creelman, 1991; Swets, Tanner, & Birdsall, 1961; Tanner & Swets, 1954), it is only an indication of adopting different decision biases or criteria. According to SDT, the true ability of discrimination referred to as sensitivity (*d*') and the stringency of the criterion (bias) used in a recognition decision can be separated. Although adopting a more stringent criterion can decrease, and adopting a less stringent criterion can increase the frequencies of hits and false alarms, the shifting of the criterion does not change the true discriminability between the signals and the noises. Sensitivity is measured as the distance (in standard deviation units) on the trace-strength dimension between the mean of the noise (new items) distribution and the mean of the signal (old items) distribution. Moving the criterion up (to the right), or down (to the left) on the strength dimension should not change the distance between the means of the two distributions, i.e., the value of sensitivity. Also, in SDT, confidence ratings are subjects' indications of the decision criteria they use. Therefore, showing that true recognition is rated higher in confidence than false positive recognition does not unequivocally demonstrate a change in true discrimination. Hence, the issue of whether assigning higher confidence ratings to the SW than to the CNPW in the DRM paradigm indicates conscious discrimination of CNPW from SW will be revisited in this study by examining, not the confidence rating itself as in Jou et al. (2004), but the sensitivities (*d*'s) under different confidence ratings and memory quality judgments. Thus, the first purpose of this study is to determine whether the confidence ratings in the recognition test of the DRM paradigm reflect only a criterion shift with no change in sensitivity or indicate a criterion shift as well as a sensitivity change. Similarly, the remember/know/guess (R/K/G) judgments (Gardiner, Ramponi, & Richardson-Klavehn, 1998, 2002) should not have an effect on sensitivity either, if, according to some researchers (Donaldson, 1996; Dunn, 2004; Wixted & Stretch, 2004), these judgments are no more than criterion or bias shift in a recognition decision. Whether this basic SDT principle holds in the DRM paradigm has yet to be found out. If subjects demonstrate higher sensitivities when they give higher confidence ratings, then it means that they can consciously discriminate false memory from true memory. In other words, they "know" when their memory is more accurate and when less accurate. In that sense, they make the false alarm errors more or less "knowingly". Note that according to the SDT, the true discrimination index *d*' should not change with the increase or decrease in confidence rating. Therefore, if this basic SDT principle holds in the DRM paradigm, subjects should not show better sensitivities when they give higher confidence ratings than when they give lower confidence ratings. However, if this turns out to be not the case in the DRM paradigm, then one can argue that the DRM paradigm is an exceptional or limiting condition to the principles of SDT, which, in addition to being of interest to the conceptualization of false memory, is in itself an important discovery and has important theoretical implications for the SDT as well. The finding will provide the answer to this question: Do subjects respond "old" to the CNPW because they have absolutely no way of distinguishing the SW from the CNPW or because they are actually consciously accepting words that they know are questionable by simply adopting a lower decision criterion.

Response speed sometimes can be indicative of implicit learning or knowledge (Lewicki, Hill, & Bizot, 1988; Stadler, 1993). Therefore, a second question asked in this study is whether there is any evidence that false memory is *unconsciously* discriminable from true memory given that Jou et al. (2004) showed that the mean RT for false positive recognition was longer than for the hits. In other words, can this RT difference between the two types of memory be attributed to an unconscious source of discrimination? Jou et al. (2004) as well as some others (Leonesio & Nelson, 1990; Robinson, Johnson, & Herndon, 1997) indicated that RT and confidence rating in recognition memory were inversely correlated, i.e., lower confidence was associated with longer RT and vice versa. Furthermore, Jou et al. (2004) found that false recognition memory was associated both with longer RTs and lower confidence ratings than true memory. Assuming that confidence rating reflects conscious experiences and given that it is correlated with RTs, is it possible that RT difference between the false memory and true memory is accessible to conscious awareness? The idea that RTs may be accessible to conscious evaluation is consistent with the notion of *fluency heuristic* (Hertwig, Herzog, Schooler, & Reimer, 2008; Kelley & Linday, 1993; Koriat & Ma'ayan, 2005). If confidence rating can account for the RT difference between true and false memories, then it can be argued that subjects are conscious of this RT difference between the two types of memories. If the RT difference between the hits and false alarms to the CNPW cannot be fully accounted for by confidence (i.e., if there is a significant residual in RT variance due to true versus false memories), then it can be suggested that the residual part of the RT variance that can be attributed to type of memory

[1] False memory in this paper refers to the false memory as defined in the DRM paradigm. The conclusions reached in this paper may or may not be applicable to false memory in general or in the everyday-life sense of the term.