



# Dissociating measures of associative memory: Evidence and theoretical implications <sup>☆</sup>

Melanie Cohn <sup>\*</sup>, Morris Moscovitch

*Department of Psychology, University of Toronto, 100 St. George Street, Toronto, Ont., Canada M5S 3G3  
Rotman Research Institute, Baycrest Centre for Geriatric Care, Canada*

Received 29 August 2006; revision received 5 June 2007  
Available online 26 July 2007

---

## Abstract

In four experiments, the authors investigated whether two measures of associative recognition memory (associative identification and associative reinstatement) are dissociable from one-another on the basis of their reliance on strategic retrieval and are dissociable from item recognition memory. Experiment 1 showed that deep encoding of relational information, but not of individual items, increased both types of associative memory significantly, as indexed by both measures, while it only marginally increased item memory. Experiments 2–4 showed that a short response deadline, a speeded recognition and an overlapping pairing condition interfered with associative identification, but left associative reinstatement unaffected. Associative reinstatement provides a measure of associative memory, but unlike associative identification, it is less reliant on strategic retrieval processes. We propose that associative familiarity underlies this measure. This process may index binding of information at encoding without involving the vivid, conscious re-experiencing characteristic of recollection at retrieval.

© 2007 Elsevier Inc. All rights reserved.

*Keywords:* Associative memory; Item memory; Recollection; Familiarity

---

<sup>☆</sup> The authors thank Stephen M. Emrich and Katherine Duncan for their assistance in conducting the experiments, Marilyne Ziegler for her programming skills and Patrick S.R. Davidson, Deborah Talmi, Andrew P. Yonelinas, Neil A. MacMillan, and William E. Hockley for helpful comments. This work was supported by the Natural Sciences and Engineering Council of Canada Grant No. CFC 205055 Fund 454119 and the Canadian Institutes of Health Research Grant MT No. 6694.

<sup>\*</sup> Corresponding author. Present address: Department of Psychology, University of Toronto, 100 St. George Street, Toronto, Ont., Canada M5S 3G3.

*E-mail address:* [melanie@psych.utoronto.ca](mailto:melanie@psych.utoronto.ca) (M. Cohn).

The formation, retention and retrieval of new associations depend on memory for the individual items (item memory) and of their associations (associative memory). Recognition tasks of item memory typically require participants to discriminate between studied and unstudied items. There are two different ways to test associative memory on recognition tests. The typical way is an associative identification recognition task that requires participants to identify the associated information explicitly by discriminating between studied and novel combinations of items that they had already experienced (*associative identification*). In that test, item memory is equivalent for targets and distractors because all the

items had been studied previously. Thus, participants must retrieve the relational information to make this distinction. The other way is a pair recognition task in which the reinstatement of the associated information improves recognition of the associated items without requiring explicit identification of the association (*associative reinstatement*). *Associative identification* requires explicit knowledge of the recovered associations akin to recall, especially in rejecting familiar items that are rearranged in a novel way. *Associative reinstatement* makes no such demands as participants are required to respond positively to all familiar items as “studied old items”, but their recognition will be better for those items that appear as they had in the studied context. For example, when retrieving pairs such as AB and CD, participants in the identification condition have to distinguish these items explicitly from the rearranged pairs (e.g., accept AB, but reject AD). Rejecting AD demands explicit knowledge of the association as both items are familiar. In associative reinstatement, participants respond positively to both intact and rearranged pairs (AB and AD), but their performance should be better for those items that reinstate the initial studied context (AB > AD).

In this paper, we compare these two ways of testing associative memory to reveal the different demands these tests make on retrieval and, by doing so, illuminate the nature of associations. We report dissociations not only between item and associative memory, which have been well documented, but also between associative identification and associative reinstatement. As we noted, associative reinstatement is less reliant on effortful strategic retrieval processes and, thus, not only provides a different measure of associative memory, but also suggests that associative information may be represented differently. Such dissociations have interesting implications for how we conceptualize associative memory from a cognitive and neuropsychological perspective.

Although people have studied associative memory using both types of tests, to our knowledge, only one study by Castel and Craik (2003) has contrasted both measures in a single experiment. The advantage of doing so is that encoding is identical in the two cases as is the material at test, the only difference being the retrieval processes elicited by the different task demands. Consequently, such a comparison allows us to focus directly on possible differences between types of associative memory without the confounding effects of encoding and test material. Our study extends the work of Castel and Craik (2003), which found similar reductions on both measures in conditions of divided attention at encoding and in a group of older adults. Specifically, we test potential dissociations not only at encoding, but also at retrieval, where we believe the critical differences exist between the two measures.

We first review some of the literature on associative identification and associative reinstatement, two fields of study that are somewhat isolated from one-another.

#### *Associative identification*

An extensive portion of our knowledge of associative memory and of its distinct qualities relative to item memory comes from behavioural, neuroimaging and neuropsychological studies using associative identification recognition tasks. In terms of behavioural studies, manipulations such as repetition at study (Cleary, Curran, & Greene, 2001), increased rehearsal duration (Nairne, 1983), decreased lag between study and test (Hockley, 1991, 1992) and priming of items before study (Westerman, 2001) enhanced item memory but had little or no effect on associative identification. Relative to item memory, associative identification is enhanced for high frequency words (Clark, 1992), has a slower retrieval time (Gronlund & Ratcliff, 1989), shows distinct Receiver Operating Characteristics (Kelley & Wixted, 2001; Rotello, Macmillan, & Van Tassel, 2000; Yonelinas, 1997), and is associated with more self-reported judgments indexing conscious recollection (remember) and fewer judgments representing general feeling of oldness or familiarity (“know” responses; Hockley & Consoli, 1999). With respect to special populations, greater decline in associative identification relative to item memory was documented in amnesic patients with bilateral damage to medial temporal lobe structures (Giovanello, Verfaellie, & Keane, 2003; Turriziani, Fadda, Caltagirone, & Carlesimo, 2004; but see Stark, Bayley, & Squire, 2002 for alternative findings), patients with Alzheimer’s disease (Gallo, Sullivan, Daffner, Schacter, & Budson, 2004) and healthy older adults (Castel & Craik, 2003; Naveh-Benjamin, 2000).

These findings suggest that item and associative memory may rely on distinct neural substrates. This is supported by neuroimaging studies showing greater prefrontal, hippocampal and parietal activations for encoding of associations (Achim & Lepage, 2005a; Henke, Weber, Kneifel, Wieser, & Buck, 1999) and greater dorsolateral prefrontal cortex activation for retrieval of the associations on an associative identification recognition task (Lepage, Brodeur, & Bourgouin, 2003; Rugg, Henson, & Robb, 2003), especially when rejecting rearranged pairs, suggesting that this region is involved in post-retrieval monitoring (Achim & Lepage, 2005b). On the flip side, item memory retrieval is associated with a distinct pattern of activations in frontal, medial temporal and parieto-temporal regions, but is not associated with increased activations at encoding relative to associative memory (Achim & Lepage, 2005a).

Dual-process models of recognition memory (e.g., Atkinson & Juola, 1974; Jacoby, 1991; Mandler, 1980; Yonelinas, 1997) provide a framework to account for

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات