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The Two Faces of Memory Retrieval

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Does retrieval of a specific memory affect recollection of related memories? For instance, does selective remembering of part of a traumatic experience, or part of an incidentally observed crime, affect memory for other details of the event? Casual subjective experience suggests that memory retrieval can improve recollection of related memories. When one is talking with a friend about a common, long-forgotten vacation, remembering a first piece of the event often initiates a chain of retrieval processes, along which more and more of the seemingly forgotten memory is recollected. However, this subjective experience contrasts with scientific experiments that have demonstrated that selective remembering typically impairs recollection of related material (for reviews, see Anderson, 2003; Bäuml, 2008; Roediger & Neely, 1982). Here, we show that selective memory retrieval can both impair and improve related memories, suggesting the existence of two faces of memory retrieval.

The subjectively experienced, beneficial effects of retrieval often pertain to outdated memories, whereas the scientifically observed, detrimental effects of retrieval typically pertain to more current memories (e.g., Anderson, 2003). We therefore examined whether the effects of selective memory retrieval depend on the memory status of the encoded material, being beneficial for outdated memories but detrimental for more current memories. To test this proposal, we employed a directed-forgetting task and examined the effects of selective memory retrieval on to-be-remembered and to-be-forgotten material. Participants were given two item lists to study. After studying the first list, they received a cue to either forget or continue remembering the items on that list (e.g., Bjork, 1989). They were then instructed to study the second list. Later, memory for predefined target items from the first list was tested. Before target recall, part of the list's remaining items were selectively retrieved (in all but one condition).

Method

Eighty undergraduates (mean age = 22.2 years, range: 19–29 years) took part in the study. They received €5 for their participation. The experiment had a 2 × 4 mixed factorial design: Cue (remember or forget) was manipulated within participants, and nontarget retrieval (0 or 4 or 8 or 12 items) was varied between participants. In the *remember* condition, List 1 was followed by a cue to remember the list for an upcoming test, whereas in the *forget* condition, List 1 was followed by a cue to forget the list. Order of conditions and assignment of lists to conditions were counterbalanced (e.g., Zellner & Bäuml, 2006). Retrieval conditions differed in the number of nontarget items participants were asked to retrieve before List 1 target items were tested.

Two pairs of study lists were constructed, each list containing 16 unrelated concrete German nouns (e.g., Bäuml & Kuhbandner, 2009). Lists serving as List 1 consisted of 4 target and 12 nontarget items each. Each target in a list pair had a unique initial letter; the remaining items began with unique word stems. Items were studied individually and in random order for 5 s each. Testing differed in whether instructions asked participants to recall 0, 4, 8, or 12 of the nontargets before they recalled the targets. For testing, nontargets were selected randomly from the list's set of 12 nontarget items, and the selected items' unique word stems were presented. Recall of targets was tested by presenting the targets' unique initial letters. For both item types, the item cues were presented successively and in random order, for 6 s each. Responses were given orally. List 2 items were tested subsequently, but results for these lists are not reported.

Results

Prior nontarget recall affected recall of to-be-remembered and to-be-forgotten targets differently, $F(3, 76) = 6.57$, $p < .001$. As a linear trend analysis showed, recall of to-be-remembered targets decreased linearly, $F(1, 76) = 12.60$, $p < .001$, and recall of to-be-forgotten targets increased linearly, $F(1, 76) = 4.58$, $p < .05$, as more and more of the nontargets were previously retrieved (see Fig. 1). This pattern of retrieval-induced forgetting for to-be-remembered items and retrieval-induced facilitation for to-be-forgotten items led to an ironic reversal in recall rates: Whereas memory was better for to-be-remembered than for to-be-forgotten items when targets

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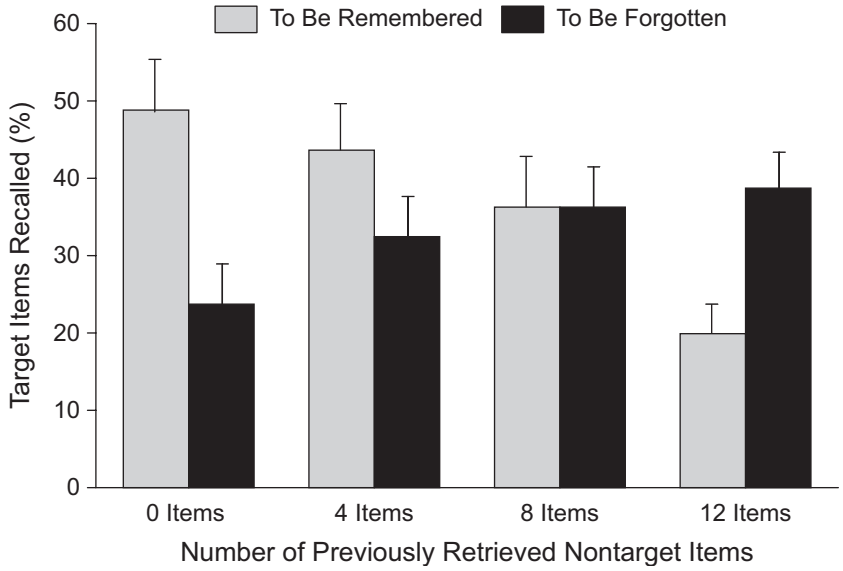

Fig. 1. Mean percentage of predefined target items recalled as a function of the items' memory status (to be remembered or to be forgotten) and prior selective retrieval of nontarget items (0 or 4 or 8 or 12 nontarget items). Error bars represent standard errors.

were tested first (0-item condition), $F(1, 19) = 8.26$, $p < .01$, memory for to-be-forgotten items exceeded that for to-be-remembered items when targets were tested last (12-item condition), $F(1, 19) = 13.57$, $p < .01$. Nontarget recall did not vary significantly with cue (remember: 82.2%; forget: 82.8%) or nontarget retrieval condition (4 items: 85.6%; 8 items: 81.5%; 12 items: 80.5%), all ps > .35.

Discussion

The results reveal two faces of selective remembering. They demonstrate that whether retrieval induces forgetting or brings related memories back to mind depends on the memory status of the encoded material. When operating on to-be-remembered memories, selective retrieval induces inhibition of related memories, causing failure in retrieval of the related information (Anderson, 2003; Roediger & Neely, 1982). In contrast, when operating on to-be-forgotten memories, selective retrieval spreads activation to other outdated memories, facilitating recollection of the related information (for a related result in a different paradigm, see Chan, 2009, or Chan, McDermott, & Roediger, 2006). Inhibition and spreading activation were once regarded as rival explanations of the effects of memory retrieval (Roediger & Neely, 1982). Our finding unifies the two views, suggesting a role for inhibitory and spreading-activation processes in selective memory retrieval.

The facilitatory effect of selective remembering on recall of related memories is a desirable feature of the human mind when reaccess to outdated memories is required. Indeed, memories once evaluated as irrelevant (e.g., details about an incidentally observed crime) can become relevant again in the future (e.g., when one is called before a court as a possible material witness). However, reaccess to outdated memories need not always be desirable. When one accidentally retrieves part of an unwanted memory, such as an emotionally draining event (e.g., a traumatic experience), other parts of the event may be reactivated, causing personal discomfort or harm. Combatants coming home from war often refuse, even indefinitely, to report any personal experiences from the war. Although this behavior may be hard for family and friends to accept, this study suggests that such conduct can be adaptive, and may protect people from recollecting more of their unendurable past.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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References

Anderson, M.C. (2003). Rethinking interference theory: Executive control and the mechanisms of forgetting. *Journal of Memory and Language*, *49*, 415–445.

Bäuml, K.-H. (2008). Inhibitory processes. In J.H. Byrne (Series Ed.) & H.L. Roediger, III (Vol. Ed.), *Cognitive psychology of memory: Vol. 2. Learning and memory: A comprehensive reference* (pp. 195–220). Oxford, England: Elsevier.

Bäuml, K.-H., & Kuhbandner, C. (2009). Positive moods can eliminate intentional forgetting. *Psychonomic Bulletin & Review*, *16*, 93–98.

Bjork, R.A. (1989). Retrieval inhibition as an adaptive mechanism in human memory. In H.L. Roediger, III, & F.I.M. Craik (Eds.),

Varieties of memory and consciousness: Essays in honour of Endel Tulving (pp. 309–330). Hillsdale, NJ: Erlbaum.

Chan, J.C.K. (2009). When does retrieval induce forgetting and when does it induce facilitation? Implications for retrieval inhibition, testing effect, and text processing. *Journal of Memory and Language*, *61*, 153–170.

Chan, J.C.K., McDermott, K.B., & Roediger, H.L., III. (2006). Retrieval-induced facilitation: Initially nontested material can benefit from prior testing of related material. *Journal of Experimental Psychology: General*, *135*, 553–571.

Roediger, H.L., III, & Neely, J.H. (1982). Retrieval blocks in episodic and semantic memory. *Canadian Journal of Psychology*, *36*, 213–242.

Zellner, M., & Bäuml, K.-H. (2006). Inhibitory deficits in older adults: List-method directed forgetting revisited. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *32*, 290–300.