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Is awareness of the ability to forget (or to remember) critical for demonstrating directed forgetting?

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ABSTRACT

Directed forgetting magnitude increases when participants use forgetting strategies (Foster & Sahakyan, 2011). Furthermore, intentional forgetting ability may depend on memory monitoring if active engagement in the task is motivated by awareness of this ability. Accordingly, across four experiments, we investigated whether people judged that they could engage in intentional forgetting by measuring the sensitivity of list-level, or *global*, judgments of learning (JOLs). Participants studied two lists of words: List 1 was cued to be forgotten or remembered, but List 2 was always cued to be remembered. JOLs for both lists were collected under contexts of actual forget or remember cues (single-cue groups; Experiments 1, 2, and 4) or hypothetical remember and forget cues (contrasted group; Experiments 3 and 4). Sensitivity to directed forgetting costs was most evident when JOLs were made in close temporal proximity, suggesting that beliefs about costs emerge from contrasting the cues. Sensitivity to directed forgetting benefits depended on (a) List 2 study and (b) beneficial influence that forgetting List 1 had on List 2. Also, awareness of directed forgetting rarely coincided with actual directed forgetting effects. These results suggest that intentional forgetting does not depend on awareness of the ability to forget.

Introduction

A primary function of memory is to encode and retain recently learned information for later recall, but imagine if you remembered everything that you perceived. The buildup of proactive interference (e.g., Wickens, 1970) would likely make it difficult to remember new target information. Research on directed forgetting has revealed a solution to this problem by showing that people can make themselves forget previously studied material. Specifically, instructions to forget previously studied material impair later recall and sometimes recognition of that material (see MacLeod, 1998, for a review). Importantly, a beneficial side effect of instructions to forget is enhanced memory for material studied later (e.g., Sahakyan & Delaney, 2003, 2005). In the present article, we explore the degree to which people's awareness of directed forgetting effects contributes to both costs (lower performance for the forget list) and benefits (better performance for the remember list) of directed forgetting.

Before discussing our approach that combined directed forgetting and metamemory methods, we describe in further detail how the costs and benefits of directed forgetting have been demonstrated, which provides the foundations of the present research. First, items from two lists (List 1 and List 2) are presented individually to participants. After presenting the final List 1 item, participants receive instructions to remember List 1 (remember group) or to forget List 1 (forget group). Both groups then study List 2, which is always to be remembered. Free recall

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performance for List 1 is impaired for the forget group compared to the remember group, an effect referred to as the directed forgetting *costs*. The forget group, however, often shows enhanced recall of List 2 compared to the remember group, an effect referred to as the directed forgetting *benefits*. Thus, people can make themselves forget recently studied information while showing an enhanced ability to remember information to be studied in the future (for a review, see Sahakyan, Delaney, Foster, & Abushanab, 2013).

Progress has been made toward identifying the mechanisms of directed forgetting costs and benefits (e.g., Bjork, 1972; Geiselman, Bjork, & Fishman, 1983; Jongeward, Woodward, & Bjork, 1975; Sahakyan & Delaney, 2005; Sahakyan & Kelley, 2002). Most relevant to our present aims, the role that metacognitive processes play in directed forgetting is just beginning to be established. In particular, a recent experiment using the list method showed that significant directed forgetting costs and benefits are observed only when people report using a forgetting strategy (Foster & Sahakyan, 2011), implicating the importance of control in directed forgetting. However, whether people are aware of the effects of directed forgetting on List 1 recall (costs) and List 2 recall (benefits) is currently unknown, and whether this awareness is evoked during the list method may be critical to understanding why people attempt to control their forgetting after receiving a cue to forget.

One hypothesis from metacognitive control theory (e.g., Nelson & Narens, 1990) is that monitoring and control work interactively in this context. Namely, after studying items on List 1, the forget cue may trigger awareness that forgetting of the list can occur to at least some degree; that is, the forget cue may activate beliefs about the ability to intentionally forget. It is then this awareness – or belief – in the possibility of directed forgetting that provokes strategic behavior (e.g., thinking about ideas unrelated to the experiment, increasing attention and rehearsal of List 2, or engaging in more efficient study strategies for List 2) and is in part responsible for the costs and benefits of directed forgetting. Such a link between beliefs and behavior has been firmly established by research on self efficacy, in which people's beliefs about whether they can perform well on a task lead to changes in strategic behavior and to subsequent performance (for general reviews, see Bandura, 1977; Multon, Brown, & Lent, 1991; for reviews focusing on memory, see Hertzog, Dixon, & Hultsch, 1990; Valentijn et al., 2006). Nevertheless, it is an open question as to whether people's awareness about directed forgetting as they are performing a task is necessary for obtaining directed forgetting effects both in terms of its costs and benefits.

We address this question across four experiments by evaluating two specific hypotheses derived from the metacognitive control theory described above (Nelson & Narens, 1990). The *awareness hypothesis* pertains to the degree to which people are aware (or believe) that they can forget when they are presented with the *forget* cue. The second and related hypothesis pertains to the potential contribution of people's awareness to subsequent directed forgetting effects; that is, the degree to which awareness is directly linked to directed forgetting, which we call the *link hypothesis*. Importantly, these hypotheses are also orthogonal to the directed forgetting costs and benefits, so that the hypotheses may hold for one effect (e.g., costs) but not for the other (benefits). This relation between hypotheses and directed forgetting effects is illustrated in Table 1. Due to methodological constraints, we did not evaluate all four hypotheses (i.e., two pertaining to each of the directed forgetting effects) in each experiment, so Table 1 also includes an overview of which hypotheses were evaluated in each experiment as indicated by a check in the appropriate cell. Table 1 highlights that our main focus was on directed forgetting costs (check marks for both hypotheses under "costs" for each experiment), because these have been most widely explored in the literature (for a review, see Sahakyan & Foster, in press). By contrast, although we did explore the awareness hypothesis for directed forgetting benefits in all experiments, the *link hypothesis* for benefits was evaluated in only Experiment 2.

We evaluated these hypotheses using slightly different methods across experiments, which also include direct replications (for recent emphasis on the importance of replicating novel effects, see LeBel & Peters, 2011; Ledgerwood & Sherman, 2012; Pashler & Harris, 2012; Roediger, 2012). Nevertheless, the general method we used integrated metacognitive measures with directed forgetting methods. In particular, we examined the influence of remember and forget cues on global judgments of learning (JOLs), which are predictions about future memory for recently studied items. A global JOL involves having participants make a single judgment about the recallability of an entire list of items, which can occur either immediately prior to studying the list (a prestudy global JOL) or immediately after studying the list. Importantly, global JOLs may reflect beliefs about memory as well as the ease of encoding (Koriat, 1997; Koriat & Ma'ayan, 2005; Koriat, Bjork, Sheffer, & Bar, 2004; Mueller, Dunlosky, Tauber, & Rhodes, 2014; Mueller, Tauber, & Dunlosky, 2013). As we explain next in the context of Experiment 1, collecting global JOLs during a directed forgetting task allowed us to understand people's awareness about, and sensitivity to, the effects of directed forgetting instructions.

Experiment 1

In Experiment 1, participants performed list-method directed forgetting, where the forget and remember cues were presented in a within-subject multi-list procedure (see also Bjork & Bjork, 1996; Zellner and Bäuml, 2006). Eight blocks were presented to each participant, where an individual block involved studying a new "List 1" and "List 2" followed by a test of one of the lists (for details on the procedure, see Table A1 in Appendix). After studying List 1, participants received a cue to remember or to forget that list. List 2 was always followed by a remember cue. During each block, we had participants make a global JOL after presentation of the List 1 cue.

Combining directed forgetting with global JOLs allowed us to evaluate the *awareness hypothesis* and the *link hypothesis* of directed forgetting costs, as well as the *awareness hypothesis* of directed forgetting benefits (see the leftmost