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Memory, monitoring, and control in the attainment of memory accuracy

Colleen M. Kelley* and Lili Sahakyan

Department of Psychology, Florida State University, Tallahassee, FL 32306-1270, USA

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Abstract

Three experiments assessed people's ability to strategically regulate memory accuracy in free report. Older adults were substantially less accurate than young adults in free report cued recall. Both older and younger adults made gains in memory accuracy from forced report to free report, but older adults did so at the expense of greater losses in quantity correct. This pattern of gains in accuracy at the cost of losses in quantity was mediated by the level of memory monitoring, and older adults showed less correspondence between their confidence judgments and the accuracy of their responses. When young adults encoded items with full vs. divided attention, the resulting differences in retention set off a cascade of effects including poorer memory monitoring and, ultimately, lower accuracy in free report. We suggest that older adults' problems with memory monitoring and memory accuracy stem from impairments in their ability to re-collect details of events.

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How do people regulate memory accuracy in the face of wide variations in their ability to remember? In answering that question it is critical to distinguish between conditions where responding to each item is forced, as in recognition tasks, and conditions where responding is under the control of the rememberer, as in recall tasks. Under free report conditions such as recall, people may choose not to answer memory queries unless they can recollect specific details of an event. That strategy would manifest itself as losses in the quantity of memory, which is the typical measure in memory experiments. Koriat and Goldsmith (1994) refer to quantity as an input-bound measure of memory performance, as it represents the number of correct memory responses as a function of the number of items input at study. In contrast, one can measure the accuracy of responses that

people give under conditions of free report. Accuracy is an output-bound measure of performance as it represents the number of correct memory responses as a function of the number of items a person chooses to output. Even when candidate responses lack recollected details and are merely familiar, people could still maintain a high level of memory accuracy in that the responses that they do volunteer could be correct as often as those volunteered by people under conditions where recollection is high. Although losses in the quantity of memory performance are problematic, losses in accuracy would create additional difficulties, particularly for social interactions where others would assume that reported memories are indeed accurate.

In this paper, we propose that memory accuracy is modulated by the quality of evidence for a candidate response in conjunction with people's assessment of the quality of that evidence as they monitor those candidate responses. The quality of evidence for a candidate response refers to the validity of the evidence that the

* Corresponding author. Fax: 1-850-644-7739.

E-mail address: Kelley@psy.fsu.edu (C.M. Kelley).

candidate response is actually a memory. For example, recollection of specific details of an episode is typically highly diagnostic of having experienced an episode. But people have other bases for responding when recollection fails such as responding with any familiar, plausible, or even easily generated alternative (cf. Jacoby & Hollingshead, 1990; Reder, 1987; Reder, Wible, & Martin, 1986). If such alternatives to recollection are less valid, then memory performance could suffer, both in terms of omissions, which would reduce memory quantity, and in terms of commissions or false memories, which would reduce memory accuracy.

Memory accuracy depends not only on the validity of the basis for responding, but on the metamemorial monitoring and control processes that lead people to either offer a response or withhold it (Koriat & Goldsmith, 1996; Nelson, 1996). If people use alternatives to recollection to respond to memory queries, but can sensitively monitor the validity of those alternatives, then they could adjust their responses accordingly. Less valid responses could be withheld when accuracy was most important and volunteered when quantity was most important. Thus, differences in free report memory performance across conditions and across populations need to be analyzed both in terms of potential differences in the bases for responding and in terms of potential differences in monitoring and/or control. We examine these issues in younger and older adults, two groups known to differ in memory retrieval, and possibly in terms of monitoring and control processes as well.

Memory monitoring and control

To assess the role of memory monitoring and control in cued recall, we use the framework developed by Koriat and Goldsmith (1996). Their model distinguishes between retrieval, monitoring, and control. Retrieval is captured by the quantity of correct answers generated in a forced report phase where people generate candidate responses, guessing if necessary. Then, people attempt to monitor the validity of a candidate response and assign it a probability, P_A , of being correct. They exercise control over their responding by setting a criterion, P_{RC} , and compare the assessed probability, P_A , to the response criterion, P_{RC} . Items for which P_A equals or exceeds the response criterion are output, and items that fall below the response criterion are withheld. People exercise control over responding by adjusting their response criteria in accord with situational factors such as explicit payoffs.

Memory performance in free report is thus dependent on three factors in addition to retrieval. The first is monitoring effectiveness, which is the degree to which assessed probabilities of correctness successfully differentiate between correct and incorrect candidate answers.

The second factor is control sensitivity, which refers to the degree to which people base their decision to report or withhold an item on that item's assessed probability of being correct. The third factor is response criterion setting, which can be adjusted upward if there are large losses associated with a commission error, or downward if there is no penalty for a commission error and a premium is placed on the quantity of correct answers. Under high incentive conditions for accuracy compared to low or moderate incentives, people will be able to increase accuracy if they have effective monitoring of the probability of the correctness of candidate answers, good control sensitivity, and effective response criterion setting.

Koriat and Goldsmith (1996) have applied their model to experiments which probed general knowledge under various accuracy incentives. They demonstrated that monitoring effectiveness, control sensitivity, and response criterion setting all need to be taken into account to predict trade-offs in quantity and accuracy measures between forced and free report. In addition, they decomposed monitoring effectiveness into two factors: polarization and correspondence. Polarization refers to the distribution of probability assessments. If there is no variability in assessed probabilities of correctness, then the outcome of the monitoring process is not useful for control. The other extreme is high polarization, where a person might assign probabilities of only 0 or 100 to candidate responses. High polarization will be an effective basis for control, but only if there is also good correspondence between those assessed probabilities and actual probabilities of correctness. People could differ in their monitoring effectiveness because of differences in polarization and/or differences in correspondence.

Input to the monitoring process: The diagnosticity of evidence

The input to the monitoring process, that is, the quality of evidence that a response is a memory, may affect the monitoring process itself. When a possible memory includes the recollection of details, and even memories of events that preceded or followed from the event, the probability that it is indeed a memory rather than a product of imagination is high. But people also use other perhaps less diagnostic bases for responding to memory queries. The important question is whether they can effectively evaluate whether a candidate response that is merely familiar or plausible is indeed a memory.

Older adults in particular are apt to make recognition judgments based on memory for the gist of an episode or plausibility of a probe, rather than recollection of an event (Koutstaal & Schacter, 1997; Koutstaal, Schacter, Galluccio, & Stofer, 1999; Norman & Schacter, 1997;

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