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Correcting False Memories

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Although often impressive, memory is far from perfect. For example, the sentence "The karate champion hit the cinder block" is often misremembered as "The karate champion broke the cinder block" (Brewer, 1977). Hearing a list of related words including *bed*, *rest*, and *tired* leads people to claim that *sleep* was presented, when in fact it was not (Roediger & McDermott, 1995). Answering the question "How fast was the white sports car going when it passed the barn while traveling along the country road?" increases witnesses' later reports of having seen a nonexistent barn in an earlier video (Loftus, 1975, p. 566). These examples represent just a few of the many ways in which memory can go astray. Not only are these errors easily created, but they often become vivid false memories that are held with high confidence. For instance, false memories for nonpresented words (as in the *sleep* example) are so vivid that people often claim to remember which of two voices said the word (Payne, Elie, Blackwell, & Neuschatz, 1996).

False memories can also be strikingly persistent. Warnings about memory errors are rarely effective (McDermott & Roediger, 1998), especially after the study phase (Greene, Flynn, & Loftus, 1982). Reexposure to events is insufficient; hearing the list including *bed*, *rest*, and *tired* again reduces, but does not eliminate, false memories for *sleep* (McDermott, 1996; Watson, McDermott, & Balota, 2004). Even interventions that pinpoint specific contradictions between subjects' memories and the original events are inadequate; many errors remain uncorrected, even after subjects place an "X" next to each false memory (McConnell & Hunt, 2007).

Despite an abundance of evidence that false memories are difficult to correct, a finding from another literature suggests a surprising prediction about the correction of false memories. In studies demonstrating the *hypercorrection effect*, participants answer general knowledge questions and rate their confidence in each response before viewing the correct answer. High-confidence errors are more likely to be corrected on a second test than are incorrect guesses (e.g., Butterfield & Metcalfe, 2001). For example, someone who strongly believes that Sydney is the capital of Australia benefits more from the feedback "Canberra" than someone who simply guesses "Sydney." In the false memory domain, the surprising corollary is the proposal that confidently held false memories should be corrected more often than other errors.

To test this hypothesis, we created false memories using sentences that encourage inferences. For example, "The clumsy chemist had acid on his coat" is often misremembered as "The clumsy chemist spilled acid on his coat." We examined the ability to correct false memories as a function of initial confidence in the errors.

Method

Forty-six undergraduates studied 48 sentences (e.g., "The karate champion hit the cinder block"); each sentence was presented for 3,500 ms and implied an action (e.g., "broke"). Materials were from McDermott and Chan (2006). On a subsequent test, each sentence was presented with a word or words deleted (e.g., "The karate champion ____ the cinder block"), and subjects tried to fill in the blank with the exact studied wording. On average, 2.08 words were needed to complete each sentence. Subjects rated their confidence in each response using a 7-point scale, and then the original sentence reappeared for 4 s with the previously missing portion in boldface type (e.g., "The karate champion **hit** the cinder block"). Subjects then participated in an unrelated experiment for 10 min, before being retested on all sentence fragments.

Results

Following McDermott and Chan (2006), we categorized each answer as correct (e.g., "hit"), a nonstudied inference (e.g., "broke"), or another error (e.g., "kicked"). For details regarding the scoring of responses, along with the distribution and calibration of confidence judgments on the initial test, see the Supplemental Material available online. Initially, inferences (M = .51) were more common than correct answers (M = .25), $t(45)$ = 8.23, SEM = .03, or other errors (M = .25), $t(45)$ = 11.74, SEM = .02. However, following feedback, participants corrected many of the errors. On the final test, participants completed more fragments correctly (M = .74) than with

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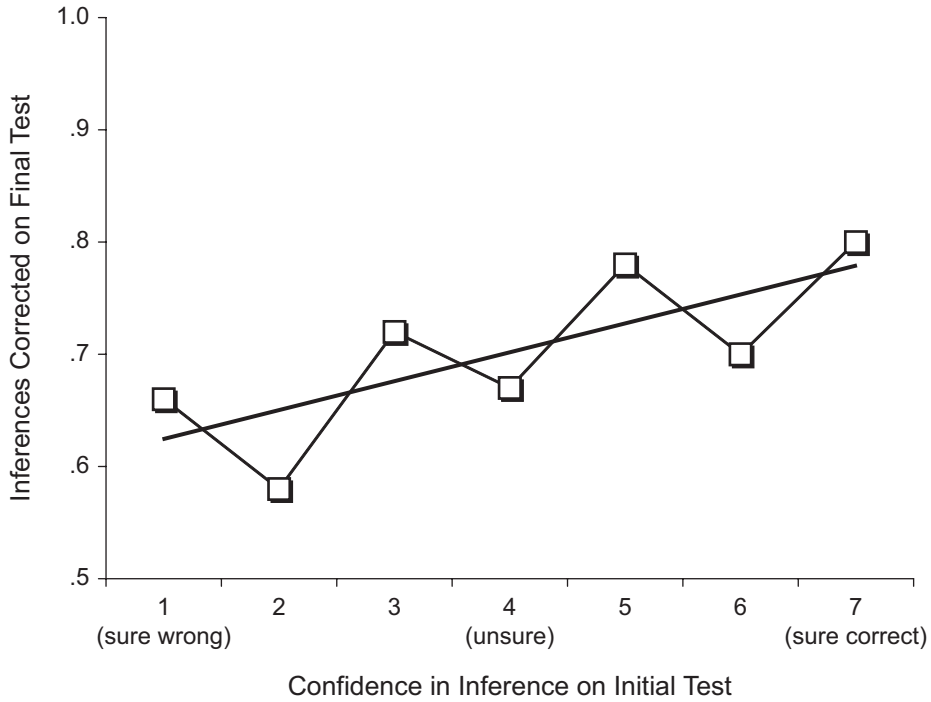

Fig. 1. Average proportion of the inferences on the initial test that were corrected on the final test, as a function of initial confidence rating. The boldface line is the best-fitting trend line.

inferences (M = .14), $t(45)$ = 17.24, SEM = .03, or other errors (M = .12) , $t(45)$ = 19.89, SEM = .03.

Our focus was on which errors were corrected on the final test and on whether there was hypercorrection of false memories. Our results (Fig. 1) confirmed that high-confidence memory errors were more likely to be corrected on the final test than were low-confidence memory errors. The within-subject gamma correlation between initial confidence and later correction was positive and significant, γ = .13, $t(44)$ = 2.05, SEM = .06. The same pattern was obtained when inferences were combined with other errors, γ = .14, $t(45)$ = 2.51, SEM = .06.

Discussion

With feedback, participants corrected more than two thirds of their errors (M = .71). Critically, we found hypercorrection of false memories: Following feedback, subjects corrected more false memories (made with high confidence) than erroneous guesses. The implication for other episodic memory errors is that corrections will be most likely when feedback contradicts subjects' expectations.

Hypercorrection of false memories is consistent with the idea that people attend more to feedback when it is surprising—a hypothesis based on Rescorla and Wagner's (1972) animal learning model. Supporting this argument, Fazio and Marsh (2009; see also Butterfield & Metcalfe, 2006) found that people are better at remembering the color that feedback was presented in if the feedback follows a high-confidence error or a correct guess. An alternate explanation assumes that the hypercorrection effect occurs because confidence in errors is correlated with knowledge about the target domain. For example, most readers of this journal will be more confident when answering questions about psychology than when answering questions about chemistry. However, they will remember feedback concerning an error in psychology better than feedback concerning an error in chemistry because the psychology feedback can be associated to their preexisting knowledge. Our study, however, controlled for background knowledge. All false memories depend on activation of meaning structures, but this is uncorrelated with confidence in episodic memories. Our finding of hypercorrection for episodic memories means that differences in domain knowledge cannot be solely responsible for the hypercorrection effect.

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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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Supplemental Material

Additional supporting information may be found at http://pss.sagepub.com/content/by/supplemental-data

References

Brewer, W.F. (1977). Memory for the pragmatic implications of sentences. *Memory & Cognition*, *5*, 673–678.

Butterfield, B., & Metcalfe, J. (2001). Errors committed with high confidence are hypercorrected. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *27*, 1491–1494.

Butterfield, B., & Metcalfe, J. (2006). The correction of errors committed with high confidence. *Metacognition and Learning*, *1*, 69–84.

Fazio, L.K., & Marsh, E.J. (2009). Surprising feedback improves later memory. *Psychonomic Bulletin & Review*, *16*, 88–92.

Greene, E., Flynn, M.S., & Loftus, E.F. (1982). Inducing resistance to misleading information. *Journal of Verbal Learning & Verbal Behavior*, *21*, 207–219.

Loftus, E.F. (1975). Leading questions and the eyewitness report. *Cognitive Psychology*, *7*, 560–572.

McConnell, M.D., & Hunt, R.R. (2007). Can false memories be corrected by feedback in the DRM paradigm? *Memory & Cognition*, *35*, 999–1006.

McDermott, K.B. (1996). The persistence of false memories in list recall. *Journal of Memory and Language*, *35*, 212–230.

McDermott, K.B., & Chan, J.C.K. (2006). Effects of repetition on memory for pragmatic inferences. *Memory & Cognition*, *34*, 1273–1284.

McDermott, K.B., & Roediger, H.L., III. (1998). Attempting to avoid illusory memories: Robust false recognition of associates persists under conditions of explicit warnings and immediate testing. *Journal of Memory and Language*, *39*, 508–520.

Payne, D.G., Elie, C.J., Blackwell, J.M., & Neuschatz, J.S. (1996). Memory illusions: Recalling, recognizing, and recollecting events that never occurred. *Journal of Memory and Language*, *35*, 261–285.

Rescorla, R.A., & Wagner, A.R. (1972). A theory of Pavlovian conditioning: Variations in the effectiveness of reinforcement and nonreinforcement. In A.H. Black & W.F. Prokasy (Eds.), *Classical conditioning II: Current research and theory* (pp. 64–99). New York: Appleton-Century-Crofts.

Roediger, H.L., III, & McDermott, K.B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *21*, 803–814.

Watson, J.M., McDermott, K.B., & Balota, D.A. (2004). Attempting to avoid false memories in the Deese/Roediger-McDermott paradigm: Assessing the combined influence of practice and warnings in young and old adults. *Memory & Cognition*, *32*, 135–141.