Short Report

The Dark Side of Expertise

Domain-Specific Memory Errors

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Expertise in a specific domain can lead to exceptional memory performance, such that experts can typically encode and retrieve large amounts of domain-related information. For example, chess experts can reproduce the exact locations of chess pieces from a game that is in progress (Chase & Simon, 1973; de Groot, 1966), baseball experts can recall large amounts of baseball-related information (Voss, Vesonder, & Spilich, 1980), and a college student used extensive knowledge of track and field to accurately recall long strings of rapidly presented digits (Chase & Ericsson, 1982). However, there are some costs associated with expertise, such that memory accuracy may actually decline in certain situations. For example, although doctors are more accurate than 3rd-year interns at making diagnoses, they are worse at recalling the exact information they used to make a diagnosis (Patel & Groen, 1991; Schmidt & Boshuizen, 1993). Arkes and Freedman (1984) found that on a recognition task, baseball experts made more false alarms to domain-relevant distractors compared with nonexperts, and Baird (2003) found that business majors displayed more domain-relevant intrusions than other students when recalling esoteric business terms.

One potential explanation for the benefits and costs of expertise is based on organizational principles of knowledge. Specifically, these benefits and costs may be due to incoming information being incorporated with existing schemata and easily accessed later (e.g., Bédard & Chi, 1992). Van Overschelde, Rawson, Dunlosky, and Hunt (2005) found that participants with high levels of knowledge about American football (i.e., the National Football League) were more likely than low-knowledge participants to recall an "isolate" (i.e., a college football team that was included in a list of professional teams). Although high domain knowledge enhances access to and recall of domain-relevant information, this type of enhanced activation can also lead to increases in memory errors (Roediger & McDermott, 1995; Smith, Ward, Tindell, Sifonis, & Wilkenfeld, 2000).

In the present study, we examined whether the organizational processing that benefits experts' memory performance and leads to a rich encoding context can also increase intrusions during recall. Individuals with high and low levels of knowledge about American football (football experts and nonexperts) studied a list of familiar animal names, all of which were also names of football teams (e.g., lions, broncos, and bears), as well as a control list of body parts. Thus, all of the stimuli were familiar to participants, but the animal names were likely processed differently depending on level of football expertise. We expected football experts to recall more animal names than nonexperts because these names were also names of football teams and thus fit a well-organized schema, but we also expected that activation of this schema would increase intrusions of nonpresented animal names that represented football teams. We expected no differences between groups in performance for the control list.

METHOD

Participants

Forty undergraduates at Washington University in St. Louis participated for course credit. All were between the ages of 18 and 23.

Materials and Procedure

Participants were asked to study and recall two successively presented lists of words (with order counterbalanced across participants). One list consisted of high-typicality body parts (Battig & Montague, 1969), and the other consisted of National Football League team names that are also animal names. Eleven animal names were studied in the following fixed random order: *dolphins*, *broncos*, *falcons*, *colts*, *jaguars*, *bengals*, *seahawks*, *rams*, *lions*, *ravens*, and *bears*; 3 animal names were not studied but were used to measure intrusions during recall (*eagles*, *panthers*, and *cardinals*). Eleven names of body parts were studied by participants in the following fixed random order:

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knee, *eyes*, *arm*, *mouth*, *foot*, *stomach*, *toes*, *finger*, *ear*, *neck*, and *hand*; 3 names of body parts were used to measure intrusions during recall (*leg*, *head*, and *nose*). Stimuli were presented visually. The animal names and body parts were studied in separate lists, each of which was preceded by a 5-s screen reading "List 1" or "List 2." Studied items were presented for 1 s each, with a 1-s blank screen between items. After studying the lists, participants engaged in a spatial filler task for 10 min and were then asked to recall the words from each studied list for 4 min.

Following the memory test, football knowledge was assessed using a 30-item multiple-choice football questionnaire based on the questionnaire used by Van Overschelde et al. (2005). An item analysis indicated high internal consistency ($\alpha = .92$).

RESULTS AND DISCUSSION

Football Knowledge

The median score on the football questionnaire was 17.5. Twenty participants were assigned to the low-knowledge group (17 or below), and 20 were assigned to the high-knowledge group (18 or above).

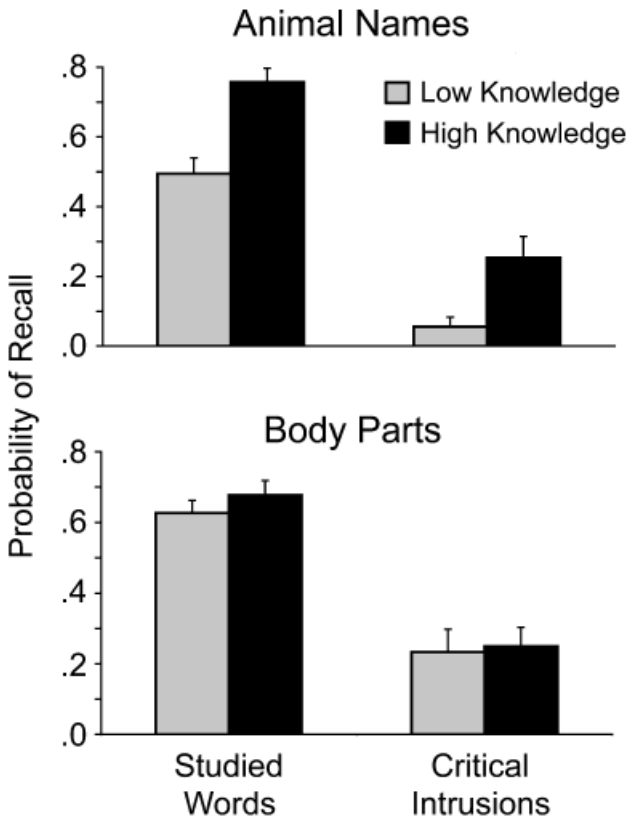

Fig. 1. Correct recall and domain-relevant intrusions for the lists of animal names (top panel) and body parts (bottom panel). Results are shown separately for groups with low and high football knowledge. Error bars represent standard errors of the means.

Recall

The recall data are presented in Figure 1. High-knowledge participants recalled more animal names than did low-knowledge participants, $F(1, 38) = 21.06$, $p_{rep} > .99$, $\eta^2 = 0.36$, but also falsely recalled more of the three nonpresented animal names that were associated with football teams than did low-knowledge participants, $F(1, 38) = 6.29$, $p_{rep} = .93$, $\eta^2 = 0.14$. Thus, although expertise conferred the benefit of better recall of studied items, it also conferred the cost of more intrusions. Testing memory for the list of body parts, a category that was unrelated to the domain of expertise, enabled us to ensure that the differences between the high- and low-knowledge groups in recall for animal names were not simply due to general differences in knowledge or memory ability. For the list of body parts, high-knowledge and low-knowledge participants did not differ either in correct recall of studied items or in false recall of the three nonpresented items (Fs < 1), despite the overall level of intrusions being slightly higher for body parts than animals (see Fig. 1).

The present findings indicate that under some circumstances, the organizational processing that benefits experts also has a "dark side"; specifically, it can lead to recall of domain-relevant information that was not presented. These data are consistent with the notion that memory errors are a by-product of associative activation that results from experience in a domain (Roediger, Watson, McDermott, & Gallo, 2001) and from using category knowledge to guide retrieval (Smith et al., 2000). Thus, expertise might lead to reconstructive processing at retrieval (e.g., Schacter, Norman, & Koutstaal, 1998), and this can lead to better recall in terms of quantity, but also inefficient monitoring for memory errors within the domain of expertise.

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