

Benjamin, A. S., Kester, J. D., Craik, F. I. M., & Black, S. (2001).
Pathological familiarity and false recognition: A case study.
Brain and Cognition, 47, 310-313.

84. Pathological Familiarity and False Recognition: A Case Study

A. S. Benjamin,* J. D. Kester,† F. I. M. Craik,‡ and S. Black§

†University of Toronto and the Rotman Research Institute at Baycrest Centre; †University of Toronto; ‡Rotman Research Institute at Baycrest Centre; and §Sunnybrook Hospital, Toronto, Ontario, Canada

We report the results of two tests in a left frontal patient (JM) who had frequent experiences of familiarity that were not grounded in actual experience. The first experiment examined recognition of pictures that were differentially related to studied pictures. JM showed a normal function relating degree of association to false recognition. Overall, however, her false-alarm rate (FAR) was much higher than for control subjects, indicating a different basis for her decisions. In the second experiment, each distractor during the recognition test was presented twice, with different lags separating the two presentations. The control subjects showed an increase in FAR with increasing lag, but JM showed a decrease. These results are interpreted in the context of dual-process theories of recognition and the role of the frontal lobes in such tasks. © 2001 Academic Press

In this report, we discuss patient JM, who displays characteristics of being unable to use generic familiarity judiciously in the context of a recognition decision. JM presented with complaints (mostly on the part of her husband and son) of experiencing an undue sense of familiarity for events, places, and people that she was not, in fact, familiar with. We report here the results of two experiments that address the ability of JM to make decisions of recognition and, more importantly, to use her sense of familiarity in such decisions. Our findings are generally consistent with those reported for patient BG (e.g., Curran, Schacter, Norman, & Galluccio, 1997) and patient JB (Parkin, Bindschaedler, Harsent, & Metzler, 1996), who each also showed dramatic levels of false recognition.

JM has a large left frontal contusion from blunt head trauma 22 years previously, from which she recovered well. One year prior to the study, she was becoming forgetful, and neuropsychological testing showed impaired delayed verbal and nonverbal recall with otherwise intact cognitive functioning. MRI showed generalized atrophy and left frontal encephalomalacia. One year into her course, she began to experience the pervasive “de’ja`vu” feeling mentioned earlier, a feeling that ameliorated somewhat when she was put on valproic acid (between Experiments 1 and 2). Her EEG showed sharp waves in the left frontal region. She has subsequently deteriorated cognitively, and has been diagnosed as having early stage probable Alzheimer’s disease.

Although there is consensus that the frontal lobes play a critical role in the normal

functioning of human memory, the particular functions that these areas appear to subservise are quite varied. Moreover, frontal lobe damage impairs a variety of cognitive functions, including attention, inferential reasoning, and problem solving. This extensive and disparate catalogue of deficits associated with frontal damage has led scholars to search for general mechanisms common to these task impairments. Several viable suggestions are available, including the hypothesis that frontal regions play an important role in the inhibition of irrelevant or distracting stimuli. Part of the appeal of such a broad explanation is its ability to reconcile disparate views of whether frontal functions are executive or mnemonic in nature: Because inhibitory processes play a critical role in both types of functions, the focus is on a process that is logically antecedent to the normal use of both memory and more executive functions.

We interpret JM's deficit in the context of dual-process theories of recognition, in which familiarity combines with other processes to produce normal recognition behavior. Because recognition is composed of both mnemonic and decision-making components, it is a particularly appropriate task for revealing the pathological consequences of frontal damage. In this case, we mean familiarity to be a phenomenological sense of pastness, but of a nonspecific sort: If we see our postal carrier out of context, for example, we may know that we recognize her, but be unable to determine from where (e.g., Mandler, 1980). If we can recover the source of our sense of familiarity—that is, recognize that this stranger is in fact our postal carrier—then the sense of familiarity disappears.

In the task of recognition, subjects are asked to decide, for each of series of words shown to them, whether that particular word had been shown to them in an earlier episode. Because familiarity will generally be higher for previously seen than new words, these judgments can be made on the basis of a sense of familiarity. However, because other factors affect familiarity, other bases for recognition lead to much higher accuracy. In Experiment 1, we show that JM is similar to normal elderly subjects in that she is more prone to falsely recognizing stimuli that bear semantic similarities to studied stimuli. However, her propensity to be misled by such “gist” information (e.g., Reyna & Brainerd, 1995) is much greater than nonpathological elderly subjects. In Experiment 2, we demonstrate that JM relies almost exclusively on familiarity as a basis for recognition by using the recognition-lag procedure of Jennings and Jacoby (1997).

Experiment 1

Method. JM and the control subjects were presented with a series of 72 linedrawn pictures, 6 from each of 12 semantic categories. The presentation was selfpaced, and the subjects were asked to name each item. After the study period and a 1-min interval, the test began. For the test, the 72 pictures from the study phase were presented along with 72 distractors. Of the distractors, 12 were high-ranking members of the semantic categories from which the study pictures were drawn, 12 were lowranking members, and 48 were semantically unrelated. Subjects were asked to say “yes” if the picture had been presented during the immediately preceding study session and “no” if it had not.

Results and discussion. In the top half of Table 1 are presented the results of the recognition test for JM and the control subjects. Hit rates did not differ between JM and the control subjects. Both JM and the control subjects were more likely to false alarm to items that were from the same semantic category as the studied pictures; however, FAR is considerably higher for JM than controls. These results demonstrate that JM is similar to normal elderly, in that she is more prone to falsely recognizing

TABLE 1
Recognition Performance for JM and Control Subjects in Experiments
1 and 2

Experiment 1		New items		
Old items		Hi-rank	Lo-rank	Unrelated
JM	.99	.67	.50	.25
Control	.91	.13	.01	.00

Experiment 2		New items			
Old items		1st pres.	Lag1	Lag3	Lag8
JM	.25	.07	.50	.46	.29
Control	.93	.02	.02	.03	.04

stimuli that are semantically similar to previously encountered material, but that this tendency is greatly exaggerated in JM. This finding is consistent with the hypothesis that JM's recognition performance is strongly influenced by simple familiarity, applied without respect to the source of that familiarity.

Experiment 2

Method. The study phase and test instructions were the same as in Experiment 1. On the test, each old item was presented once, but this time each distractor was presented twice, yielding a total of 216 test items. Of the 72 represented distractor stimuli, 24 were presented with only one intervening item, 24 were presented with three intervening, and 24 were presented with eight intervening. For these repeated items, familiarity and source memory foster different responses: The most recently presented items (i.e., the shortest lags) are the most familiar, but are also the easiest to source back to presentation during the *test*, rather than during the study phase. For normal subjects, FAR rises with increasing lag, due to the decreasing ability to discriminate between these two potential sources. If JM truly relies on pure familiarity for her recognition decisions, then we expect to see FAR start high and decrease with lag, owing to the decrements in familiarity.

Results and discussion. In the bottom half of Table 1 are shown the results of the recognition test. On the left side of the table are the hit rates and FAR to the first presentation of the distractor items. JM was significantly worse than the control subjects in her ability to make accurate recognition decisions, but her performance is well above chance. Overall, her FAR was substantially lower than in Experiment 1, suggesting that either her treatment or her progressing dementia was overshadowing the effects of hyperfamiliarity. The right half of the table presents false-alarm rates from the second presentation of the distractors as a function of lag condition. Control subjects show the normal increase in FAR with lag, whereas JM shows a decrease in FAR with lag. This result is consistent with the notion that JM has only one basis for the recognition judgment and that that basis is nonspecific with respect to source. In other words, it appears as though familiarity is the only basis on which JM is making her recognition decisions.

General Discussion

In dual-process theories of recognition (e.g., Mandler, 1980), familiarity is augmented by a process that provides a more reliable basis for the judgment. In JM, familiarity appears to play an uncharacteristic role in recognition: It is used to an unwarranted degree and does not appear to be augmented by the typical ancillary process of source monitoring. This fact is reflected both in her extreme FAR in Experiment 1 and in the slope of the function relating her FAR to presentation lag in Experiment 2. The neuropsychological dissociation evident in JM's recognition performance corresponds with empirical and analytic dissociations of familiarity and source monitoring in nonpathological subjects (e.g., Benjamin & Craik, 1999). We propose that one role of frontal cortex is to execute "veto" capacity over highly familiar stimuli by virtue of its ability to monitor source. This ability may be related to the hypothesized inhibition deficit mentioned earlier. Large source monitoring deficits have been reported in frontal patients and we have suggested that this same ability plays a critical role in recognition (Benjamin & Craik, 1999). For this reason, frontal damage impairs only the source-monitoring aspect of recognition, and familiarity-based recognition is spared in JM.

REFERENCES

- Benjamin, A. S., & Craik, F. I. M. (1999). Parallel effects of aging and time pressure on memory for source: Evidence from the spacing effect. Manuscript under review.
- Curran, T., Schacter, D. L., Norman, K. A., & Galluccio, L. (1997). False recognition after a right frontal lobe infarction: Memory for general and specific information. *Neuropsychologia*, *35*, 1035–1049.
- Jennings, J. M., & Jacoby, L. L. (1997). An opposition procedure for detecting age-related deficits in recollection: Telling effects of repetition. *Psychology and Aging*, *12*, 352–361.
- Mandler, G. Recognizing: The judgment of previous occurrence. *Psychological Review*, *87*, 252–271.
- Parkin, A. J., Bindschaedler, C., Harsent, L., & Metzler, C. (1996). Pathological false-alarm rates following damage to the left frontal cortex. *Brain and Cognition*, *32*, 14–27.