(1996). In L.M. Reder (Ed.), Implicit Memory and Metacognition. Mahwah, NJ: Erlbaum.

Chapter 13

Memory Attributions: Remembering, Knowing, and Feeling of Knowing

Colleen M. Kelley
Macalester College

Larry L. Jacoby
MacMaster University

Over the last several years, much of our research has been aimed at uncovering the bases for the subjective experience of memory and devising methods to separately measure those bases. We have been particularly interested in the effects of implicit memory or automatic influences of memory on judgments. How does that work relate to questions about metacognition? After agreeing to write this chapter, we went through a long period thinking the answer was "it doesn't." As the deadline for the chapter drew near, we became more creative (desperate?) in our analysis, and have now arrived at the position that metacognition and implicit memory are so similar as to not be separate topics. Questions concerning awareness are central for both metacognition and for implicit memory.

We first describe our analysis of the fluency heuristic: the notion that one basis for the feeling of familiarity is the ease of perceiving events or retrieving ideas. We describe experiments that manipulated fluency to create illusions of memory, and other experiments that manipulated fluency via providing past experiences to create illusions of perception, fame, knowing, and believing. The misinterpretation of effects of past experience shapes current subjective experience, which can influence people's predictions for others as well as for themselves. Some of those experiments could be described either as investigations of implicit memory or as investigations of metacognition.

Next, we argue that the problems that arise when one attempts to separate different bases for judgments are relevant to questions about

metamemory. In particular, we suggest that there is an important relation between theories that propose that familiarity serves as an alternative to recollection as a basis for recognition memory, and theories about the feeling-of-knowing and the tip-of-the-tongue phenomenon. The subjective experience of recollection carries with it a specification of the source of a memory and so affords people control over whether they will be influenced by a particular prior experience. In contrast, the subjective experience of familiarity does not specify its source and so affords less control. For metacognition as well as for recognition memory, it is important to separate such nonanalytic bases for judgments that can be affected by irrelevant factors from more analytic bases for judgments that allow people to selectively control the factors that enter into their judgments.

FLUENCY AS A BASIS FOR JUDGMENTS

One important basis for the subjective experience of memory is the ease with which to-be-recognized items are perceived and the ease with which to-be-recalled items are generated (Jacoby & Dallas, 1981; Jacoby, Kelley, & Dywan, 1989). Because prior experiences commonly bias perception and cognition, the fluency of perception and thinking is generally a valid indicator that one has seen something before. For example, perceptual identification of briefly presented words is enhanced if the words have been studied previously (Jacoby & Dallas, 1981).

If ease of perceptual processing is a cue that can serve as the basis for the feeling of remembering, then it should be possible to subtly manipulate ease of perceptual processing and create illusions of remembering. To create memory illusions, Jacoby and Whitehouse (1989) varied the ease with which words on a recognition memory test were perceived. Subjects studied a list of words and then took a recognition test. For some recognition test words, a brief preview of the word occurred immediately beforehand. For both old and new words on the recognition memory test, the preview of the test item increased the probability of judging an item "old," presumably by facilitating perceptual processing of the test word (for similar results, see Rajaram, 1993; Whittlesea, Jacoby, & Girard, 1990).

An important contrast in the Jacoby and Whitehouse (1989) study is between a condition under which participants were aware of the preview word versus a condition under which participants were unaware of the preview word. When the preview word was presented for a longer duration and could be clearly seen, there was no effect on the subjective experience of "oldness" of the recognition test words. Presumably, participants correctly interpreted the familiarity of the recognition test word as stemming from the preview. In fact, participants had a tendency to overcorrect for the influence of the preview word on the familiarity of the recognition test word, and were slightly less likely to call a recognition test item "old" when it was preceded by a matching preview word in the aware condition. The contrast between the aware and unaware conditions in Jacoby and Whitehouse fits with the notion that the subjective experience of memory is an attribution or inference.

Fluency reflecting conceptually driven processing can also be misattributed and give rise to an illusion of memory. Whittlesea (1993) created illusions of memory by presenting the recognition test word at the end of a sentence that strongly predicted the word, such as "The stormy seas tossed the BOAT." Again, hiding the source of fluency was important for creating the memory illusion. Lindsay and Kelley (1996) found that ease of generating an item during cued recall contributes to the subjective experience of remembering. Subjects could escape the false memory effect if they were informed of the manipulation that led some words to be easily generated.

Although fluency of perception and ease of recalling is a generally valid indicator of past experience, it does not perfectly specify its source, which is why we can create illusions of memory. Because of this lack of specificity, people can also misinterpret the fluency resulting from past experience as actually being due to other factors. For example, fluent perceptual processing contributes to the subjective experience of duration and intensity of a stimulus, so fluency due to prior experience can lead people to think a visually presented word is exposed for a longer duration (Witherspoon & Allan, 1985) or that auditorally presented sentences are exposed against lower background noise (Jacoby, Allan, Collins, & Larwill, 1988). Affective judgments such as pleasantness are also partially based on the ease of processing of stimuli. Jacoby et al. (1989) suggested that the "mere exposure effect" in studies of aesthetic preferences is a case of the misattribution of the fluency due to prior experience. In accord with this, Bornstein and D'Agostino (1994) found that the mere exposure effect was largest under conditions where participants were unlikely to realize that past experience was actually the source of perceptual fluency occurring during the pleasantness judgments (see also Seamon et al., 1995).

FLUENCY AND METACOGNITIVE JUDGMENTS

Fluency is also an important constituent of more cognitive judgments such as knowing and believing. In the "false fame" paradigm, reading a list of nonfamous names increases the nonspecific familiarity of those names. Consequently, when participants are later asked to judge whether the names are famous or nonfamous they are apt to misinterpret that familiarity

as fame (Jacoby, Woloshyn, & Kelley, 1989). Misattribution of the familiarity as fame was particularly likely when participants could not remember having studied the name in the first phase. In some experiments, we placed the fame effect in opposition to recognition of the source of familiarity (the study list) by correctly informing participants that all names studied in the first list were nonfamous. This "method of opposition" ensured that any increase in false fame resulting from study of the names in the first phase was due to familiarity in the absence of recollection, and so let us identify familiarity as a separate process. In fact, manipulations such as dividing attention during the study phase vastly reduced participants' ability to recollect having studied an item on the list, but did not affect familiarity as measured by the fame judgments.

Another judgment that depends partially on familiarity is truth. Repeated exposure to statements about obscure topics (e.g., the length of the right arm of the Statue of Liberty) increased the rated truth of those statements (Begg, Armour, & Kerr, 1985; Hasher, Goldstein, & Toppino, 1977). Such "illusions of truth" depend on the misattribution of the familiarity of facts due to prior exposure to those facts being true (Begg, Anas, & Farinacci, 1992).

The metacognitive judgment of confidence in the answers to general knowledge questions also depends partially on fluency, in particular, the fluent generation of an answer to the question. To illustrate, what was Buffalo Bill's last name? If an answer comes quickly to mind, how do you know it was correct? Kelley and Lindsay (1993) found negative correlations between the latency to think of an answer and confidence in that answer (see also Nelson & Narens, 1990). They then manipulated the speed with which participants thought of answers by having them read a list of answers prior to attempting to answer the questions. Prior exposure to correct answers (e.g., Cody) increased the speed and frequency with which correct answers were given on the general knowledge test and increased participants' confidence in those answers. Even stronger evidence for the claim that the speed with which an answer comes to mind is a basis for confidence was gained by changing what answers came to mind. Illusions of knowing occurred when participants studied closely related but incorrect answers (e.g., Hickock). Those studied incorrect answers were more likely to be confidently given as answers to the general knowledge questions. Kelley and Lindsay (1993) argued that those effects of prior study could occur without conscious memory for the list of words. In fact, when memory of the answers was placed in opposition to correctness by informing participants that all studied answers were incorrect, prior study nonetheless influenced what answers were produced when memory was rendered poor by dividing subject's attention during study or during test.

PREDICTING FOR OTHERS

We have also explored the misattribution of fluency due to past experience when people are attempting to make judgments for others. Some researchers have extended the domain of metacognition to predictions for others, notably Jameson, Nelson, Leonesio, and Narens' (1993) studies of the feeling of another's knowing. The aim of those studies was to explore the cues to the feeling of knowing that were not privileged access to an internal monitor, but rather observable and socially shared. They found that an observer who watched a target person attempt to recall the answers to general knowledge questions predicted the target's performance on a later recognition test better than a judge who knew nothing more than the identity of the question. Observers used information about the speed of the target's response and the content of the recall attempt as a basis for their predictions. Brennan and Williams (1995) found that people who listened in on speakers' attempts to answer general knowledge questions based their FOAK ratings on intonation and response latency: Rising intonation and longer latencies led to lower FOAK ratings for answers; longer latencies led to higher FOAK ratings for nonanswers. Listeners are capable of using such cues to model the speakers' states of knowledge and so communicate more effectively.

The ability to make accurate predictions of judgments for others is central for clear communication and smooth social interactions. We began our research by proposing that in a variety of domains, judgments for others are actually based on one's own subjective experience. Subjective experience is often an accurate and efficient basis for judgment. Because people have nearly identical sensory and perceptual systems, they can accurately judge how others will experience the loudness or brightness of stimuli. Those judgments are experienced as objective judgments of the stimuli rather than an inductive leap from one's own experience. Only when people try to predict for others who are different in an important way does it become apparent that the judgment is not objective, as when older people caution their children that it is too dim in a room to read and they should turn on a light before they "ruin their eyes."

More cognitive experiences also appear to faithfully mirror the objective characteristics of materials. However, subjective experience can be spoiled as a basis for judging for others because of the effect of specific past experiences. A commonplace example concerns the readability of a paper that one has written. We send a paper off to a journal convinced that it is beautifully written, only to get it back a few months later to find that the writing has deteriorated during the delay. We have mistaken our knowledge and fluent reading of the paper for that which is on the page. Happily, editors are likely to suffer the same cognitive illusion, so they can feel

great satisfaction that their recommended revision helps the paper, when what they are actually experiencing is the effect of past experience on their current reading of the paper.

We have investigated effects of this sort within the task of judging the difficulty of anagrams for others. In one of those experiments (Jacoby & Kelley, 1987), participants judged the difficulty of anagrams for others under three conditions. Anagrams were either new at the time of test, or the solution to the anagram had been read in an earlier phase of the experiment, or, in a third condition, the solution word was presented with the anagram that was to be solved, such as scarf fscar. The third condition prevented participants from having any subjective experience of the anagram's difficulty, and forced them to rely on a theory or collection of rules such as "low frequency words would be harder to solve." Participants judged how difficult anagrams would be for others to solve using a 7-point scale.

The Anagram With Solution condition served as a benchmark of theory-based judgments. In contrast, when participants had the opportunity to solve the anagrams, they used their own subjective experience as a basis for judging the difficulty of anagrams for others, as shown by the high average correlations between speed of solving the anagram and its rated difficulty (Table 13.1). Subjects were able to rapidly judge anagram difficulty when they could base it on subjective experience, relative to the theory-based judgments made in the Anagram With Solution condition. Having earlier read the solution to an anagram resulted in the anagram being judged as easier for others to solve even though it was stressed that others would not study the earlier presented list of words which contained the solution to the anagram. The correlation between RT to solve the anagram and rated difficulty was as high for old anagrams as for new anagrams, even though the participants' subjective experience of anagram difficulty was spoiled as a basis for judging for others.

TABLE 13.1
Effects of Prior Reading of Anagram Solution on Judged Difficulty for Others

	Item type		
Variable	*New Anagrams*	*Old Anagrams*	*Anagrams With Solution*
% solved	.65	.82	—
RT (ms)	10726	7115	—
Rating	3.7	3.0	3.20
Average r RT × rating	.84	.80	—
RT to rate	3017	2596	3489

Note. Rt to solve and RT to rate are in msec. Difficulty was rated on a 7-point scale from *Very Easy* to *Very Difficult.*

Were participants better at judging the difficulty of anagrams for others when they avoided using spoiled subjective experience? To answer that question, we looked at the correlation between rated difficulty and the criterion variable of time for others to solve the anagrams, when the solutions to the anagrams had not been presented, in an item analysis collapsed across subjects. Those results showed that judgments based on spoiled subjective experience captured the ranking of anagram difficulty as well as did judgments based on the experience of solving new anagrams. In contrast, depriving people of the chance to try solving the anagrams hurt people's ability to predict the performance of others.

Are our anagram studies investigations of metacognition or are they investigations of implicit memory? The answer is "both." Predicting for others is a metacognitive task, and judging the difficulty of anagrams for others in this paradigm clearly qualifies as an implicit test. A final experiment examined the importance of awareness of earlier reading a solution word for judging anagram difficulty (Kelley & Jacoby, 1996, Experiment 2).

In that experiment, participants first studied a list of words that included solutions to anagrams that would be presented in the test phase. There were three test conditions. A first test condition was the same as in the earlier experiment, in that participants were asked to solve anagrams and judge the difficulty for others. Some anagrams were new, and some were old in that the solution words had been studied in the first phase. For a second test condition, participants were informed that some of the anagrams could be solved using a word that was earlier studied, and were required to recognize whether their solution word was old or new. We thought that directing participants toward prior presentation of the solution words might eliminate its effect on judgments of difficulty. A third condition was the same as the second condition except we explained that earlier reading of a solution word would make the anagram seem easy to solve. We stressed that participants should not be misled by this apparent ease when making their judgments for others. Ratings were made by moving a game paddle to a point on a 255-point scale.

Results showed that the test of recognition memory did not eliminate the effects of prior presentation on judgments of difficulty (Table 13.2). Although recognition memory for solution words was high, participants relied on spoiled subjective experience when judging the difficulty of anagrams for others. However, they did avoid doing this when they were both warned that their subjective experience was spoiled and were forced to make recognition judgments.

Others have also shown that subjective experience is a better predictor of behavior than is a poor theory; in particular, Wilson and colleagues' work on affective versus reasoned judgments. For example, Wilson and Schooler (1991) showed that rating of jams correlated better with the ratings made by experts if people did not have to justify their ratings. They argued that

TABLE 13.2
Judgments of Anagram Difficulty by Condition

	Condition and Item Type					
	Uninformed		*Recognition*		*Informed Plus Recognition*	
	Old	*New*	*Old*	*New*	*Old*	*New*
Difficulty ratings	74.6	97.1	76.4	96.0	96.4	101.5

Note. Difficulty was rated on a 255-point scale, from *Very Easy* to *Very Difficult.* Reprinted from Kelley and Jacoby Experiment Two (1996) with permission.

forcing participants to justify their ratings turned an affective response into a cognitive decision, and in this case the cognitive judgments may have been based on a bad theory. In some domains, unanalyzed affect may capture more dimensions and weight them more appropriately than cognitive analysis.

We think people's use of subjective experience as a basis for social prediction is widespread. For example, the social psychological literature on the "false consensus" effect may stem from people using subjective experience as a basis for predicting for others. In the typical false consensus paradigm (Ross, Green, & House, 1977), people note their preference between two options, or their attitude about a topic, and then attempt to judge how many people would make the same choice or hold the same attitude. People tend to think that their preference or attitude is more common than the alternative. The false consensus effect may be analogous to our experiments on judging anagram difficulty, in that subjective experience is misinterpreted as a direct reflection of objective characteristics of the situation, unaffected by one's own prior experience and abilities.

In another case of metacognitive monitoring of others, Goranson (1985) demonstrated how teachers may be particularly prone to errors in their estimation of their students' future performance. Goranson asked a group of college instructors to fill out a quiz they were about to administer "as the average student in your class will do." Although the instructors accurately captured the ordering of difficulty of items on the quiz, they greatly overestimated how well the students would do. The instructors presumably used their own subjective experience of item difficulty as a basis for judging for the students, even though their understanding was not a good basis for prediction. This is the same pattern of results that we have found in our anagram experiments.

Similarly, Nickerson, Baddeley, and Freeman (1987) and Fussell and Krauss (1992) found that people use their own knowledge as a basis for judging what other people will know. However, we suspected that people would not take into account the effects of recent experience on the accessibility of knowledge. To test this, we had participants read a list of terms, including the answers to a set of general knowledge questions. In a second phase, participants first attempted to answer general knowledge questions and then rated the number of college students out of 100 who would know the correct answer. As in the Kelley and Lindsay (1993) study outlined earlier, prior study of the correct answers led participants to answer more questions correctly, and decreased the latency of their response. Presumably, this increase in accessibility of the answers led to the subjective experience that the "old" questions were easier than the new questions. In fact, participants estimated that more people would know the answers to questions for which the participants had read the correct answer in the first phase. As in the anagram paradigm, subjective experience of difficulty is a nonanalytic basis for predicting for others, which gives no signal as to what proportion of the accessibility of the answer is due to the answer being easy, and what proportion is due to recent reading of the answer.

ANALYTIC VERSUS NONANALYTIC BASES FOR JUDGMENTS

An important contrast in the work we have reviewed is between nonanalytical bases for judgments such as the fluency heuristic and more analytic bases for judgments such as a theory or collection of rules. Nonanalytic judgments reflect the contribution of a variety of factors operating en masse to produce a certain experience, such as the familiarity of a name or the difficulty of an anagram. In contrast, analytic judgments allow people to specify the factors that enter into a judgment. We think the distinction between nonanalytic and analytic bases for judgments applies in a wide variety of domains, including recognition memory, categorization, predictions for others, attitudes, and metacognition (see Jacoby & Brooks, 1984; Jacoby & Kelley, 1987).

How can one separate bases for judgments? In the anagram experiments, we studied people's use of a theory rather than subjective experience as a basis for judging difficulty by depriving participants of any subjective experience of anagram difficulty. This was accomplished by presenting the solution word with the anagram. In the false fame studies, we arranged it such that participants could counteract the effect of prior study of the names on later familiarity by recollecting that the name had been studied in the first phase, and then following the rule that "all studied names were not famous." This "method of opposition" allowed us to argue that all remaining effects of prior study of the words on later fame judgments was

due to familiarity in the absence of conscious recollection of the names. The method of placing two bases for judgments such as familiarity and recollection in opposition to one another provides a demonstration of the existence of familiarity as a separate process. However, if familiarity and recollection are independent processes, the method of opposition leads us to underestimate the familiarity gained from prior study of a name, because recollection and familiarity can co-occur. Under the opposition conditions, whenever recollection and familiarity co-occur, familiarity cannot affect fame judgments because it is opposed by recollection.

We have also used deadlines to separate slower analytic judgments from nonanalytic judgments. We tested first-year undergraduates at Macalester College on their attitudes toward homosexuals. Subjects were required to answer yes/no questions such as "I would feel comfortable if a member of my sex were attracted to me" after either a short deadline or with a long time to respond. First-year undergraduates appeared homophobic when forced to respond rapidly, but not when they were able to answer the questions at their own pace. The two bases for judgment may be a "gut-level" reaction versus a more reasoned and perhaps socially desirable response. Interestingly, for fourth-year undergraduates, the difference between short-deadline and long-deadline responses was no longer present. By their fourth year, students had acquired new attitudes that were expressed automatically, or were so practiced in expressing the socially desirable response that they could do so automatically.

Dovidio and Fazio (1991) used a deadline procedure to assess attitudes and found that short-deadline responses better predicted subsequent behavior than did responses made after a long deadline. That behavior is better predicted by attitudes that are automatically accessed may reflect the fact that we live in a state of mindlessness (Langer, 1989) with little reflection and analysis to guide behavior. Or perhaps our pervasive use of nonanalytic judgments when behaving indicates that we live in the "divided attention" condition.

METACOGNITION AND BASES FOR RECOGNITION MEMORY

One important focus of research in metacognition is the basis for judgments. Feeling-of-knowing judgments can be based on the familiarity of the retrieval cues, as shown by the fact that prior study of cues alone can increase FOK (Metcalfe, Schwartz, & Joaquim, 1993; Reder & Ritter, 1992; Schwartz & Metcalfe, 1992). The extent to which FOK based on cue familiarity is an accurate basis for predicting later recognition of the target depends on whether the cue and target have a shared history of presentation. It might also depend on the extent to which the identity of the cue and of the target are submerged in a larger unit.

An alternative theory of the basis for the FOK is Koriat's (1993, 1994) accessibility hypothesis. Koriat found that FOK can be based on access to partial information such that the more partial information one retrieves, the stronger the FOK. The extent to which FOK based on partial information is an accurate basis for predicting later recognition of the target stems from a fundamental property of memory—items that are committed to memory are more likely to give rise to access to correct (rather than incorrect) partial information. Thus, understanding the relation between feeling-of-knowing judgments and the information one is trying to remember (as assessed by recognition or recall) involves understanding the bases for the feeling of knowing and the relation among those bases, and the relation of each basis to later target recognition or recall.

We think these two components of FOK, cue familiarity and access to partial information, as well as final access to the target information, map onto a distinction found in recognition memory. Many two-process models of recognition memory distinguish between the ability to recollect details of a prior event versus simply having a feeling of familiarity. Here we attempt to integrate theorizing across domains by exploring the relation between theories that propose two bases for recognition memory and research on the feeling of knowing. We argue that the process underlying "Know" responses when the "Remember/Know" procedure is used to reveal two bases for recognition memory is also involved in the "feeling of knowing." Then we suggest that the advantage to be gained by relating metacognition to theories of recognition memory is that criteria for establishing the existence of and relation between different processes has recently been extensively explored in theories of memory.

First, consider examples that describe familiarity in the absence of recollection as a basis for recognition memory. Examples of this sort have been described by Wundt, James, and even Aristotle, showing that the phenomenological difference between bases for recognition is a compelling one. Brewer (1992) reviewed early philosophers who described the subjective experience of recollection and argued that it is a "natural kind." Perhaps the best known example of familiarity without recollection is George Mandler's example of meeting a person on a bus who seems familiar, but that familiarity was not accompanied by recollection of when and where the person had been encountered. Mandler later recollected that the person was his butcher. The familiarity-without-recollection state holds a striking similarity to the feeling of knowing. If a person in that state were asked whether he would be able to recognize the familiar person's occupation from a list of alternatives, he would almost certainly say yes, and would probably be successful in doing so. Also, Mandler's descrip-

tion of the subjective experience of familiarity without recollection sounds strikingly similar to the tip-of-the-tongue phenomenon.

Tulving (1985) developed an experimental paradigm to study familiarity without recollection, which has been used extensively by Gardiner and his colleagues (Gardiner & Java, 1993). For that "Remember/Know" procedure, participants are given a test of recognition memory, and for items that they call "old" are asked to indicate whether they "remember" the prior presentation of the item or only "know" that the item was on the list. For an item to qualify as "remembered," participants are told that they must remember details of the prior presentation of the item such as what they thought about when the item was presented or the context in which the item occurred. "Know" was defined with an example similar to the butcher on the bus.

A first experiment tested the possibility that the feeling of knowing revealed by use of the Remember/Know procedure is the same as the feeling of knowing investigated in studies of metacognition. In particular, the question was whether "Know" responses predict performance on a subsequent test of memory just as do feeling-of-knowing responses.

In the first phase of the experiment, participants were presented related and unrelated pairs of words that they were told to study and remember for a later test of memory (Fig. 13.1). The unrelated pairs in that list were

Phase 1: Study related and unrelated word pairs.

half whole
blue treat
alert green

Phase 2: Recognition memory test of single words as "remembered," know," or "new."

whole
treat
green
table

Phase 3: Pair-recognition memory test.

half
whole
down
alert
green
blue

FIG. 13.1. Outline of procedure for knowing and feeling-of-knowing experiment.

formed by re-pairing words from related pairs. In the second phase of the experiment, a list of words presented for a test of recognition memory included one word from each pair intermixed with new words. For each word on that recognition-memory test, participants were to say "remember," "know," or "new," depending on their memory for the word. In the third and final phase of the experiment, participants were given a test of pair recognition. For that test, words tested in Phase 2 were presented with two alternative words, one of which had been presented with the tested word during study. For each pair of alternatives, one word was related to the test word whereas the other word was unrelated to the test word. Both of the alternatives had been presented during study. Subjects were to select the alternative that had been paired with the test word during study.

Our interest was in the extent to which Remember/Know judgments in Phase 2 predicted pair recognition performance in Phase 3. A finding that pair recognition was better for words called "know" when tested alone than for words called "new" would correspond to results reported for feeling-of-knowing judgments in studies of metacognition, because the subjective experience of memory for the cue in Phase 2 would predict recognition of the target in Phase 3.

Results (Table 13.3) showed that pair recognition was most accurate for words called "remember," next most accurate for words called "know," and poorest for words called "new" in Phase 2. These results were found both for words studied in related pairs and for those studied in unrelated pairs. However, pair recognition was higher for words studied in related pairs because participants showed a bias toward selecting the alternative that was semantically related to the test word.

The results of this experiment, therefore, show that "knowing" revealed by Remember/Know judgments predicts subsequent performance just as do feeling-of-knowing judgments. Furthermore, "remembering" predicts an even higher level of subsequent recognition of the target than does "knowing." This makes sense, because one important basis for the feeling of "remembering" the cue word is retrieval of the target word, although

TABLE 13.3
Probability of Correct Pair Recognition in Phase 3 as a Function of Memory Judgment in Phase 2

	Study Pair	
	Related	*Unrelated*
Judgment in Phase 2		
Remember	.94	.79
Know	.82	.65
New	.72	.59

the retrieval of any other context would also lead to a response of "remembering." However, to better understand those results, we need to understand the relationship between remembering and knowing.

Gardiner and his colleagues have emphasized the finding of dissociations between "remember" and "know" responses produced by manipulated variables. For example, they find that directions to forget reduces the probability of a "remember" response but does not change the probability of a "know" response. The dissociations between "remember" and "know" responses are likened to dissociations between performance on direct and indirect tests of memory. The finding for directed forgetting, for example, is treated much the same as would be a finding that directions to forget reduced performance on a direct test of memory but left performance on an indirect test unchanged. Knowing is identified with familiarity that reflects automatic influences of memory or implicit memory.

The next experiment that we describe is one that shows a dissociation between "remember" and "know" responses produced by the manipulation of the number of study presentations of an item. Words were presented one, two, or three times during study, and participants made remember/know judgments. Number of presentations influenced "remembering" but left the probability of a "know" judgment invariant (Table 13.4). If familiarity is identified with the probability of a "know" response, the conclusion is that familiarity is uninfluenced by the number of prior presentations of an item. That conclusion ought to be a difficult one to accept, and we return to it later.

The major reason for interest in introspective reports is that awareness serves as a basis for control of behavior. That this is the case is illustrated by Weiskrantz (1986) in his discussion of blindsight patients, who can make some accurate forced-choice decisions about visual events in the absence of the subjective experience of seeing. However, their visual abilities do not afford them meaningful control: Even if it could be shown that blindsight patients did well on an indirect test of seeing, one would not want to let them drive. We have done a number of experiments to show the relationship between the subjective report of recollection in the form of a "remember"

TABLE 13.4
The Relationship Between Remembering and Knowing: Effects of Study Repetition

	Number of Study Presentations			
	1	*2*	*3*	*New*
Memory judgment				
Remember	.40	.51	.59	.01
Know	.35	.37	.35	.11

Study Two Lists of Words.

List 1: Read words one, two, or three presentations

List 2: Heard words.

Exclusion Test: If word was heard, respond "Old."
If word was read, respond "New."

Group 1: Short response deadline

Group 2: Long response deadline

FIG. 13.2. Outline of procedure for the experiment placing familiarity and recollection in opposition, with short versus long response deadline.

judgment, and the use of recollection as a basis for control of behavior, including the decision to withhold or produce a memory response. I (Jacoby) described some of those experiments during the CMU conference devoted to consciousness (Jacoby, Yonelinas, & Jennings, in press).

A next experiment was done to examine the effects of number of presentations on control of subsequent use of memory. Subjects read a list of words in which words were presented one, two, or three times, and then heard a second list of words (Fig. 13.2). An exclusion test condition was used to examine the effects of recollection on the control of behavior. For that test condition, participants were told to call an item old only if it was one that they heard in the experiment. They were warned that the test list would include words that they had read, and if they recollected earlier reading a word they could be certain that it was not one that they had heard. Consequently, participants should call an earlier-read word old only if it was familiar but they failed to recollect its earlier presentation. These requirements would seem to be roughly the same as the requirements for making a "know" response to a word.

The experiment was designed to show the existence of two memory processes by manipulating response deadline. Results showed that for a short deadline condition, increasing the number of presentations increased the probability of a read word being mistakenly accepted as heard, whereas the opposite was found when a long deadline was used (Table 13.5). That is, results from the short deadline showed that increasing the number of presentations increased familiarity. With a long deadline, the increase in familiarity was opposed by an increase in recollection that also resulted from increasing the number of study presentations. Reliance on recollection requires more time for responding than does a judgment based on familiarity.

We have done a large number of experiments of this sort. Dividing attention during study also reduces later recollection, but leaves familiarity

TABLE 13.5
The Advantage of Opposition of Familiarity and Recollection: Effect of Short Versus Long Deadline to Respond on Familiarity, as Assessed by Failure to Exclude Read Words

	Number of Study Presentations			
	1	*2*	*3*	*New*
Deadline				
Short	.38	.43	.47	.36
Long	.32	.29	.23	.14

intact just as does use of a short deadline. Also, words that are called "remember" on an earlier test are more likely to be correctly excluded on a later test than are words that are called "know." The opposition strategy used for these experiments is the same as for our "fame" experiments that we mentioned earlier.

Placing processes in opposition is sufficient to show the existence of two processes but does not allow one to measure their contribution to performance on a task. Performance on the exclusion task reflects the contribution of recollection as well as that of familiarity. To separate processes, one must make an assumption about their relationship.

Conclusions drawn from Remember/Know experiments differ with different assumptions about the relationship between processes. The major options are exclusivity, independence, or redundancy (see Jones, 1987). The way one calculates familiarity depends on the assumption one makes, and most research using the Remember/Know procedure has implicitly adopted an exclusivity assumption by identifying familiarity with the proportion of "know" responses, calculated as a straight proportion of the number of old items. This calculation presumes that the two processes cannot operate simultaneously. However, although the subjective experience of "remembering" probably overshadows the familiarity that is the basis for "knowing," it seems unlikely that the two processes cannot co-occur. Returning to the results of the experiment on the effects of study repetitions on "remember" versus "know," it is the exclusivity assumption that leads to the conclusion that familiarity, reflected by the probability of a "know" response, is invariant across number of repetitions. Under an independence assumption we reach a different conclusion: Both familiarity and recollection increased with number of presentations. For the independence assumption, one divides the probability of a "know" response by (1 – Remember) so as to take into account the opportunity for making such a response in the absence of "remembering."

A study of how the processes underlying "Remember" versus "Know" are affected by aging serves to further contrast the independence versus

exclusivity assumptions. Experiments analyzed under the exclusivity assumption lead to the peculiar conclusion that aging produces a decrement in the process that gives rise to "remembering," but enhances the process that gives rise to "knowing" (Parkin & Walker, 1992). In contrast, experiments analyzed under the independence assumption find a decrement in "remembering" but no effect of aging on "knowing" (Jennings & Jacoby, 1993). Similarly, experiments analyzed under the exclusivity assumption find that presenting shapes in a different size rather than the same size at study and test paradoxically increased the familiarity of old shapes (Rajaram & Roediger, in press), whereas under the independence assumption changing the size decreased familiarity (Yonelinas & Jacoby, in press). It seems far more plausible that study/test similarity increases familiarity rather than decreases it. There is a great deal of converging evidence for the independence assumption (Jacoby, Yonelinas, & Jennings, in press).

The aforementioned results cast doubt on the claim that an event cannot be both remembered and familiar—the exclusivity assumption. How do those results relate to metacognitive judgments? It is standard to request FOK judgments only for questions that cannot be correctly answered. Thus, the relation between FOK judgments and correct responses is the same as that between Know and Remember judgments. Analyzing FOK without reference to the probability of correct responding relies on an exclusivity assumption of the form that correct responding cannot co-occur with the familiarity that underlies FOK. This assumption is unattractive because familiarity is also likely to accompany correct responses. Investigations of metamemory have generally not focused on the bases for making correct responses (for an exception, see Koriat, 1993, 1994). Such differences might be important, as an example, for explaining why prior presentation of the answer to a question increases the probability of correct responding but does not influence FOK (Schwartz & Metcalfe, 1992). That pattern of results is similar to the finding, described earlier, that repetition increases "remembering" but does not influence the probability of a "Know" response. Closer examination of the Remember/Know results suggested that the lack of a change in "knowing" with repetition was because the increase in familiarity underlying "know" responses was masked by an increase in recollection. Similarly, an increase in familiarity underlying FOK produced by prior presentation of the answer to a question might be masked by an increase in correct responding.

In studies of the TOT, the effect of variables such as number of study presentations (Smith, 1994) or the presence of a phonological or semantic cue word (Meyer & Bock, 1992) is also complicated by the effect of those variables on correct responding. If the number of study presentations increases the likelihood of a correct response, how can one interpret a decrease in the likelihood of a TOT experience? Obviously, when one can

provide the name of an item, one is precluded from having a TOT experience. If in reality the TOT is based on cue familiarity or partial information, however, one would be incorrect in concluding that number of study presentations does not increase the basis for the TOT. Clearly, the assumptions one makes about the basis for the TOT and the basis for correct responding is critical for interpreting experiments.

SUMMARY AND CONCLUSIONS

Our general strategy has been to place processes in opposition as in the exclusion test paradigm to reveal the existence of separate processes and to produce illusions of memory. For example, one might use a manipulation of unconscious perception to produce false familiarity (Jacoby & Whitehouse, 1989). This approach differs from the strategy of examining how well feeling of knowing predicts subsequent behavior. However, the two approaches are clearly related. If one can produce false knowing, one knows the prediction gained from feeling of knowing is not a reading of a monitor in direct contact with the contents of memory, but is probably an inference or interpretation of certain evidence.

Are metacognition and implicit memory totally unrelated, or are the two topics so closely related that they must be treated within the same theoretical framework? Much of the excitement surrounding the dissociations that are taken as evidence for implicit memory stems from the possibility that we are pervasively and unconsciously influenced by past experiences. In contrast, metamemory research focuses on conscious experience. However, the importance of subjective experience is revealed by its absence as well as its presence. We have shown that subjective experience serves as a basis for judgments in a variety of domains, and along with others, speculate that subjective experience arises from a nonanalytic and unconscious inference or attribution.

We have generally avoided references to *implicit memory* and instead have preferred the term *automaticity*. One reason for this preference is that implicit memory implies a level of unity in its referents that we think is missing, whereas automaticity acknowledges that effects are task and situation specific. Here, again, there is a parallel to *metacognition*. That term also implies a unity of referents, perhaps linked by the operation of a servo-mechanism or monitor. For example, some have claimed that Korsakoff patients suffer a deficient monitor. We might instead focus on the basis for the Korsakoff patients' correct responses in the first phase of a feeling-of-knowing test to understand what remains to serve as a basis for their feeling-of-knowing judgments on items for which they make an error of commission or omission. Our assumption that subjective experience

relies on an inference or attribution regarding various kinds of influences points to no single entity underlying subjective experience. Our strategy has been to unpack the different bases for judgments such as recognition memory and to attempt to understand the heuristics that give rise to various judgments. Errors that result from relying on an availability heuristic or accessibility heuristic are useful for revealing the basis for judgments, but do not reflect a deficient monitor.

REFERENCES

Begg, I., Anas, A., & Farinacci, S. (1992). Dissociation of processes in belief: Source recollection, familiarity and the illusion of truth. *Journal of Experimental Psychology: General, 121*, 446–458.

Begg, I., Armour, V., & Kerr, T. (1985). On believing what we remember. *Canadian Journal of Behavioral Science, 17*, 199–214.

Blaxton, T. A. (1989). Investigating dissociations among memory measures: Support for a transfer appropriate processing framework. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 15*, 657–668.

Bornstein, R. F., & D'Agostino, P. R. (1994). The attribution and discounting of perceptual fluency: Preliminary tests of a perceptual fluency/attributional model of the mere exposure effect. *Social Cognition, 12*, 123–128.

Brennan, S. E., & Williams, M. (1995). The feeling of another's knowing: Prosody and filled pauses as cues to listeners about the metacognitive states of speakers. *Journal of Memory and Language, 34*, 383–398.

Brewer, W. F. (1992). Phenomenal experience in laboratory and autobiographical memory. In M. A. Conway, D. C. Rubin, H. Spinnler, & W. Wagenaar (Eds.), *Theoretical perspective on autobiographical memory*. The Netherlands: Kluwer.

Dovidio, J. F., & Fazio, R. H. (1991). New technologies for the direct and indirect assessment of attitudes. In J. Tanure (Ed.), *Questions about questions: Inquiries into the cognitive bases of surveys*. New York: Russell Sage Foundation.

Fussell, S. R., & Krauss, R. M. (1992). Coordination of knowledge in communication: Effects of speakers assumptions about what others know. *Journal of Personality and Social Psychology, 62*, 378–391.

Gardiner, J. M., & Java, R. I. (1993). Recognizing and remembering. In A. Collins, M. A. Conway, S. E. Gathercole, & P. E. Morris (Eds.), *Theories of memory* (pp. 163–188). Hillsdale, NJ: Lawrence Erlbaum Associates.

Goranson, R. E. (1985). *Studies of communication effectiveness*. Unpublished manuscript.

Hasher, L., Goldstein, D., & Toppino, T. (1977). Frequency and the conference of referential validity. *Journal of Verbal Learning and Verbal Behavior, 16*, 107–112.

Jacoby, L. L., Allan, L. G., Collins, J. C., & Larwill, L. K. (1988). Memory influences subjective experience: Noise judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 14*, 240–247.

Jacoby, L. L., & Brooks, L. R. (1984). Nonanalytic cognition: Memory, perception, and concept learning. In G. H. Bower (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 18, pp. 1–47). New York: Academic Press.

Jacoby, L. L., & Dallas, M. (1981). On the relationship between autobiographical memory and perceptual learning. *Journal of Experimental Psychology: General, 3*, 306–340.

Jacoby, L. L., & Kelley, C. M. (1987). Unconscious influences of memory for a prior event. *Personality and Social Psychology Bulletin, 13,* 314–336.

Jacoby, L. L., Kelley, C. M., & Dywan, J. (1989). Memory attributions. In H. L. Roediger, III, & F. I. M. Craik (Eds.), *Varieties of memory and consciousness: Essays in honour of Endel Tulving* (pp. 391–422). Hillsdale, NJ: Lawrence Erlbaum Associates.

Jacoby, L. L., & Whitehouse, K. (1989). An illusion of memory: False recognition influenced by unconscious perception. *Journal of Experimental Psychology: General, 118,* 126–135.

Jacoby, L. L., Woloshyn, V., & Kelley, C. M. (1989). Becoming famous without being recognized: Unconscious influences of memory produced by dividing attention. *Journal of Experimental Psychology: General, 118,* 115–125.

Jacoby, L. L., Yonelinas, A. P., & Jennings, J. M. (in press). The relation between conscious and unconscious (automatic) influences: A declaration of independence. In J. Cohen & J. W. Schooler (Eds.), *Scientific approaches to the question of consciousness.* Mahwah, NJ: Lawrence Erlbaum Associates.

Jameson, A., Nelson, T. O., Leonesio, R. J., & Narens, L. (1993). The feeling of another person's knowing. *Journal of Memory and Language, 32,* 320–335.

Jennings, J. M., & Jacoby, L. L. (1993). Automatic versus intentional uses of memory: Aging, attention and control. *Psychology and Aging, 8,* 283–293.

Jones, G. V. (1987). Independence and exclusivity among psychological processes: Implications for the structure of recall. *Psychological Review, 94,* 229–235.

Kelley, C. M., & Jacoby, L. L. (1996). Adult egocentrism: Subjective experience versus analytic bases for judgment. *Journal of Memory and Language, 35,* 157–175.

Kelley, C. M., & Lindsay, D. S. (1993). Remembering mistaken for knowing: Ease of retrieval as a basis for confidence in answers to general knowledge questions. *Journal of Memory and Language, 32,* 1–24.

Koriat, A. (1993). How do we know that we know? The accessibility model of the feeling of knowing. *Psychological Review, 100,* 609–639.

Koriat, A. (1994). Memory's knowledge of its own knowledge: The accessibility account of the feeling of knowing. In J. Metcalfe & A. P. Shimamura (Eds.), *Metacognition: Knowing about knowing* (pp. 115–135). Cambridge, MA: Bradford.

Langer, E. J. (1989). *Mindfulness.* Reading, MA: Addison–Wesley.

Lindsay, D. S., & Kelley, C. M. (1996). Creating illusions of familiarity in a cued recall remember/know paradigm. *Journal of Memory and Language, 35,* 197–211.

Metcalfe, J., Schwartz, B. L., & Joaquim, S. G. (1993). The cue-familiarity heuristic in metacognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 19,* 851–861.

Meyer, A. S., & Bock, K. (1992). The tip-of-the-tongue phenomenon: Blocking or partial activation? *Memory & Cognition, 20,* 715–726.

Nelson, T. O., & Narens, L. (1990). Metamemory: A theoretical framework and new findings. In G. Bower (Ed.), *The psychology of learning and motivation* (Vol. 26, pp. 125–173). New York: Academic Press.

Nickerson, R. S., Baddeley, A., & Freeman, B. (1987). Are people's estimates of what other people know influenced by what they themselves know? *Acta Psychologica, 64,* 245–259.

Parkin, A. J., & Walker, B. (1992). Recollective experience, normal aging, and frontal dysfunction. *Psychology and Aging, 7,* 290–298.

Rajaram, S. (1993). Remembering and knowing: Two means of access to the personal past. *Memory & Cognition, 21,* 89–102.

Rajaram, S., & Roediger, H. L., III (in press). In J. Cohen & J. W. Schooler (Eds.), *Scientific approaches to the question of consciousness.* Mahwah, NJ: Lawrence Erlbaum Associates.

Reder, L. M., & Ritter, F. E. (1992). What determines initial feeling of knowing? Familiarity with question terms, not with the answer. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18,* 435–451.

Ross, L., Green, D., & House, P. (1977). The "false consensus" effect: An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology, 13,* 279–301.

Schwartz, B. L., & Metcalfe, J. (1992). Cue familiarity but not target retrievability enhances feeling-of-knowing judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 18,* 1074–1083.

Seamon, J. G., Williams, P. C., Crowley, M. J., Kim, I. J., Langer, S. A., Orne, P. J., & Wishengrad, D. L. (1995). The mere exposure effect is based on implicit memory: Effects of stimulus type, encoding conditions, and number of exposures on recognition and affect judgments. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21,* 711–721.

Smith, S. M. (1994). Frustrated feelings of imminent recall: On the tip of the tongue. In J. Metcalfe & A. P. Shimamura (Eds.), *Metacognition: Knowing about knowing* (pp. 27–45). Cambridge, MA: Bradford.

Tulving, E. (1985). Memory and consciousness. *Canadian Psychologist, 26,* 1–12.

Weiskrantz, L. (1986). *Blindsight: A case study and implications.* Oxford, England: Oxford University Press.

Whittlesea, B. W. A. (1993). Illusions of familiarity. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 19,* 1235–1253.

Whittlesea, B. W. A., Jacoby, L. L., & Girard, K. A. (1990). Illusions of immediate memory: Evidence of an attributional basis for feelings of familiarity and perceptual quality. *Journal of Memory and Language, 29,* 716–732.

Wilson, T. D., & Schooler, J. W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology, 60,* 181–192.

Witherspoon, D., & Allan, L. G. (1985). The effects of prior presentation on temporal judgments in a perceptual identification task. *Memory & Cognition, 13,* 101–111.

Yonelinas, A. P., & Jacoby, L. L. (in press). The relation between remembering and knowing as bases for recognition: Effects of size congruency. *Journal of Memory and Language.*