EYEWITNESS MEMORY AND MISINFORMATION: ARE REMEMBER/KNOW JUDGMENTS MORE RELIABLE THAN SUBJECTIVE CONFIDENCE?

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We investigated the phenomenological experience of eyewitness identification following misinformation by assessing memory for specific item information (product brands). Participants selected various brands of products to put in a fictitious "care package" to be sent to soldiers deployed overseas. After this encoding episode, participants were presented post-event information. In this post-event narrative, information seen at encoding was either correctly referenced, contradicted, or additively suggested. Six-AFC recognition tasks were completed either 10 minutes or 1 week later. In addition, we examined the relationship between RK judgments and subjective confidence by assessing RK judgments independently of (Experiment 1) and along with (Experiment 2) confidence ratings for the same response. Over time, accuracy decreased by half, false alarms for misinformation doubled, and "remember" judgments for additive misinformation tripled. RK judgments and confidence were positively correlated across all conditions, and did not provide unique discriminating information. Implications for eyewitness identification in civil as well as criminal testimony are discussed.

Eyewitness identification is critical to the criminal justice system. Eyewitnesses, particularly those with no motive to deceive, are among the most persuasive of all forms of evidence (Wells, Memon, & Penrod, 2006). This is especially true of highly confident witnesses. Unfortunately, eyewitness memory is not as accurate as once believed. Recently, the advent of DNA testing has allowed many of those convicted of past crimes to have their cases reassessed. One organization, the Innocence Project, was founded in the early 1990s to assist individuals wrongly convicted of crimes. As of October, 2008, the Innocence Project has assisted 220 individuals in overturning their convictions through DNA evidence; more than two-thirds of those have occurred since 2000. Faulty eyewitness identification was a significant factor in more than three-fourths of these cases (Innocence Project, 2008). The State of Texas alone has exonerated 40 individuals, most of those in Dallas County (in part because Dallas County retained DNA samples to a greater extent than most jurisdictions). Of course, the denominator corresponding to those numbers—how many

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correct convictions were based solely on eyewitness ID?—cannot be determined without absolute knowledge of defendants' guilt or innocence, and resources do not exist to test all possible cases.

False or inaccurate memories can be created through a number of different mechanisms. Memories can be tainted by post-encoding factors such as post-event misinformation (Eakin, Schreiber, & Sergent Marshall, 2003; Frost & Weaver, 1997; Lane, 2006; Loftus & Hoffman, 1989; Wright & Loftus, 1998), particularly after a delay (Loftus, Miller, & Burns, 1978; Terrell & Weaver, 2008). In fact, false memories may be reported after merely imagining some experience with suggested information (Seamon, Philbin, & Harrison, 2006) and more closely resemble the recollective experience of true memories with repeated recounts of the false memory report (Heaps & Nash, 2001).

One key factor in witnesses' impact is the confidence with which they report their memories. Confident witnesses tend to make more persuasive witnesses (Cutler, Penrod, & Stuve, 1988; Penrod & Cutler, 1995). However, in most situations the correlation between witnesses' confidence and their accuracy is modest, at best (Sporer, Penrod, Read, & Cutler, 1995; Wells, Olson, & Charman, 2002), and can easily be distorted by post-identification feedback (Wells & Bradfield, 1998, 1999; Wright & Skagerberg, 2007). Can other factors distinguish correct from incorrect witnesses? Smith and colleagues (Smith, Lindsay, & Pryke, 2000; Smith, Lindsay, Pryke, & Dysart, 2001) showed videotaped crimes to witnesses and compared eyewitnesses' reaction times, confidence, and decision strategy (absolute vs. relative judgment on lineup tests). Decision time was a modest predictor of accuracy, but this was only true in some types of same-race identification. Under the best of conditions, these variables (as well as lineup fairness) allowed accurate and inaccurate witnesses to be distinguished with only 75% accuracy.

One judgment that may allow one to distinguish accurate from inaccurate witnesses is the "remember/know" (RK) judgment (see Conway & Dewhurst, 1995; Hyman, Gilstrap, Decker, & Wilkinson, 1998; Kelley & Jacoby, 1998; Rajaram & Rajaram, 1993). While making these judgments, individuals are asked not only to retrieve information but also to distinguish the qualitative or phenomenological nature of the memory. "Remember" judgments refer to those situations where one can mentally "relive" the experience, retrieving not just the information in question, but also the context in which the information was learned. In fact, recollection is predicted by scale measures of visual and auditory imagery, as well as emotions associated with the memory detail (Rubin, Schrauf, & Greenberg, 2003). In contrast, a "know" judgment is a familiarity-based statement of knowledge concerning an event detail retrieved in the absence of conscious recollection, often comprised by impersonal, factual knowledge associated with noetic consciousness (Tulving, 1985). "Know" judgments typically accompany memories retrieved without associative conceptual information, such as that characterized by memories that are "remembered." In more practical terms, a "remembered" experience is a memory of the reason, time, and place an event detail was encountered, while "know" judgments reflect memory without recollection of the schematic context surrounding a previous personal encounter with the memory detail.

The distinction between "remembering" and "knowing" is subtle until one takes into account several findings discerning the two. RK judgments have been widely debated as components of either the signal-detection model (SDT) or dual-process theories of memory retrieval (Dunn, 2004). The SDT model holds that individuals adopt a set of criteria for accepting currently presented information as recognized from a previous encoding experience or not (Green & Swets, 1974). This decision for accepting a signal as previously experienced (or not) lies along a continuum of familiarity with–or strength of evidence associated with–the target choices offered on a recognition task (Hirshman, Lanning, Master, & Henzler, 2002). According to the SDT model, RK judgment serves as a scale by which recognition decisions are made, such that "remember" judgments are reported for memories with strong associated evidence supporting the detail, while "know" judgments are reported for those with less supporting evidence (Hirshman & Master, 1997). This model is reminiscent of a confidence rating scale, where "remember" judgments reflect higher confidence based on memory of associated evidence, while "know" judgments reflect lower confidence in a retrieved memory item. Under this model, RK judgment is analogous to a signal-detection model of stimulus recognition where "remember" judgments indicate strong signal recognition and "know" judgments reflect weak signal recognition (Donaldson, 1996; Inoue & Bellezza, 1998; Wixted & Stretch, 2004).

In contrast, a large number of studies have directly compared RK judgment and confidence ratings whose data support a dual-process explanation for distinguishing between "remember" and "know" judgments. Under this model, "remember" judgments are recollective experiences drawing upon episodic memory, while "know" judgments reflect familiarity-based retrieval from semantic memory (Gardiner, 1988). Two separate processes are said to underlie "remembering" and "knowing," which were found to vary independently of confidence. RK judgments have been shown to vary according to the type of stimulus presented to subjects (word/non-word), but that stimulus-type had no effect on confidence ratings (sure/unsure) (Gardiner & Java, 1990). Upon comparison of the influence of prior masked presentation effects on RK judgment and confidence for old/new item recognition, it seems that "know" judgments and confidence (sure/unsure) were affected similarly by masked-priming effects, while "remember" judgments were not (Rajaram & Rajaram, 1993). That experimental variables affect the variability in RK judgments and confidence ratings in different ways leads proponents of the dual-process model to infer that RK judgment varies independently of confidence. Studies of amnesiac individuals suggest that RK judgment and confidence may even be performed under two separate cognitive processes (Rajaram, Hamilton, & Bolton, 2002).

Relatively little is known about RK judgments in eyewitnesses (however, see Frost, 2000; Haw, Dickinson, & Meissner, 2007). The present studies will use the RK judgment to indicate the degree of recollection subjects experienced as they recognized particular brands of products encountered during a novel encoding condition. The phenomenological experience of remembering suggested material from a post-event misinformation narrative is of particular interest, as is the effect of delay between encoding and retrieval on accuracy, confidence, and RK judgment for later recognition.

We use a paradigm modeled after the classic studies of McCloskey and Zaragoza (1985). In those studies, witnesses viewed slides of a petty crime, and later were questioned; witnesses were asked such details as the name of a magazine seen or the brand of soda seen on a desk. We also question eyewitnesses about brand names. In this way, our research has implications not only for traditional studies of eyewitnesses to criminal events, but also to broader issues. Those in the fields of advertising and marketing, for example, investigate product identification for the purpose of identifying factors that contribute to marketability and to uncover the cognitive mechanisms by which consumers fall prey to deceptive advertising techniques (Braun, Ellis, & Loftus, 2002; Braun & Loftus, 1998; Burke, DeSarbo, Oliver, & Robertson, 1988; Jacoby & Hoyer, 1982). In civil cases involving product liability (sometimes called "toxic tort" cases), an individual may allege that some product they used in the past caused them harm. For example, individuals allege that past exposure to asbestos in various products produced the serious health problems they may now be experiencing. Sometimes witnesses are shown a series of photographs to "refresh" their recollection of products from the distant past. (The extent to which witness memory is "refreshed" as opposed to "created" is a matter of heated discussion; see Biederman, Korosec, Lyons, & Williams, 1998; Brickman, 2004). In such cases, eyewitness testimony takes a different form—identification of specific products brands, rather than identifying a face from a lineup, for example—but many of the same issues remain (see Colby & Weaver, 2006; Krug, 2007; Krug & Weaver, 2005; Terrell & Weaver, 2008; Weaver, Terrell, & Holmes, 2006).

Following the event, participants read a narrative. This post-event information was of three types: contradictory misinformation, additive misinformation, and confirmation (correct) information. Contradictory misinformation is similar in type to actual event detail, but contradicts some aspect of the original detail. Additive misinformation suggests some detail not present in the actual event at all. These types of misinformation can interfere with retrieval of the original memory, such that individuals presented with post-encoding misinformation are more likely to retrieve post-event information than detail actually associated with the original encoding episode (Loftus, 1977; Loftus et al., 1978). Misinformation can devastate a previously encoded memory detail in that post-event misinformation permanently replaces (Loftus, Donders, Hoffman, & Schooler, 1989) or impairs access to (Morton, Hammersley, & Bekerian, 1985) previously encoded information.

Misinformation presentation may alter memories, of course, but may also affect one's subjective experience. Correctly identified original details contradicted in a written misinformation narrative are typically judged "known," while those that are correctly referenced in the narrative are typically judged "remembered" (Frost, 2000). Widely varied areas of memory research have investigated misinformation's effect on RK judgment following some eyewitness encoding condition. Stimulus prominence (Wright & Stroud, 1998), developmental processes in children (Holliday, Reyna, & Hayes, 2002), and deceptive advertising (Braun & Loftus, 1998) all affect RK judgment following misinformation presentation.

Delay can also affect proportions of RK judgments in response to both accurate and inaccurate memories. "Remember" judgments have been found to outnumber "know"

judgments for accurate responses on an immediate test for words presented on a video (Neuschatz, Payne, Lampinen, & Toglia, 2001). However, after a delay of 48 hours, the same proportion of "remember" judgments was found for both accurately and falsely recognized test items. Over time, as qualitative characteristics for memory detail decay, it becomes more difficult to discriminate between accurate and inaccurate memories of some past event (Suengas & Johnson, 1988).

The following experiments were designed to elucidate the differences in the qualitative experience of remembering accurate and false information. Do different types of post-event misinformation affect memories for product identification and what roles to confidence and RK judgments play in the identification process? The effects of delay on the accuracy (and phenomenological experience) of eyewitness memory for incidental information were also explored. In a broader sense, the present studies address the question: Is a detail judged *remembered* more likely to be accurate than one that is judged *known*? Finally, what is the relationship between two different subjective assessments: confidence ratings and RK judgments?

EXPERIMENT 1

In both experiments, subjects assembled a care package of items to donate to the Salvation Army's Operation Compassion from the Home Front, a mission that provides comfort items from home to deployed troops overseas. Then, additive and contradictory misinformation was presented in a narrative that was related to the care package assembly task, and subjects' memories of the product brands they included in the care packages were assessed with a 6-AFC recognition task either 10 minutes or 1 week after package assembly. However, before the research session, subjects only knew they would be assembling care packages–they did not know in advance that they would be reading a related article or completing a survey concerning the experience. This novel encoding event mimics the incidental encoding conditions present in both criminal and civil product liability cases. In some criminal situations, the importance of a detail is not apparent at the time the event happens. In most product liability lawsuits, individuals worked with or around products in the distant past with no knowledge that remembering the brands of those products would be important several decades later. Incidental encoding was achieved according to a Baylor University IRB-approved procedure in deceiving subjects as to the over-reaching purpose of the care package activity. Subjects were led to believe they were participating in a meaningful activity (one that is based on an actual charitable mission of the Salvation Army) and not contrived for the sake of experimentation itself. Upon completion of the questionnaire, either 10 minutes or 1 week after assembling the care packages, subjects were debriefed on the experimental objective of the care package assembly activity.

Method

Participants

One hundred thirty-eight undergraduate students from Baylor University volunteered their participation in return for course credit. All subjects signed an IRB-approved

informed consent for their participation in the experiment. Care package assembly sessions were carried out in groups of five subjects.

Materials

Subjects placed four toiletry items, a hand-held electronic game, a deck of playing cards, and a small spiral notepad into gallon-sized Ziploc bags. These items were then packed into a cardboard box however they chose. Any four out of six possible products were supplied to subjects in a randomized manner. A different brand of each type of toiletry product was provided to each subject in a session. That is, no two subjects in a given session were supplied the same brand of any toiletry product. Before commencing experimentation, normative data were collected to determine overall familiarity among six brands of each type of product, and the five most familiar brands of each product were used in the study. The brands of the products used in the study were chosen for their non-gender biased packaging and intended use. The brands of hand lotion, mouthwash, shampoo, soap, sunscreen, and toothpaste were the critical details under investigation. The game, cards, and notepad did not bear brand names, and were merely items that reinforced the care package assembly experience. In the 10-minute delay condition, subjects also read an unrelated magazine article as a distracter task between encoding and test. The misinformation narrative was a printout from the Salvation Army website, which described the care package mission and suggested products recipients have particularly enjoyed in the past. Using Microsoft Paint, and with Baylor University's IRB approval, the website was altered to include only the four brands that correctly referenced or contradicted the product brands subjects actually packed into the care package. Contradictory misinformation contradicted the brand of product subjects actually included in a care package—that is, if subjects packed Crest toothpaste, the brand Colgate may be suggested to them on a misinformation narrative. Suggesting that the subject packed toothpaste at all is correct, but the brand of the product is contradicted. Two additional brands of products were suggested that the subject did not encounter during care package assembly. If a subject included hand lotion, shampoo, soap, and toothpaste in a care package, additive misinformation would suggest that they also packed sunscreen and mouthwash. In addition to the suggested product itself, a particular brand of the product was also mentioned. Therefore, two pieces of information are suggested with additive misinformation: both a product not present in the encoding condition and a suggested brand of that product. On the other hand, contradictory misinformation contradicts the brand of a product subjects actually encountered in the encoding condition. The misinformation condition by which each product brand was referenced, and the serial position of those product brands in a list on the narrative was randomized between-subjects.

A six-alternative, forced choice recognition task was administered either 10 minutes or 1 week after care package assembly and was comprised of six questions in the following form: "What brand of hand lotion did you include in your care package?" Two questions referred to control items, which were products subjects actually included in the care package and were correctly referenced in the narrative. Two questions addressed contradictory misinformation items, which were products subjects actually included in the care package but whose brands were contradicted on the narrative. Two other questions referred

to additive misinformation items, which were products subjects did not include in the care package, but whose brands were suggested on the misinformation narrative. Following each question, subjects were asked: "Is your answer based on a feeling of knowing or a remembered experience," and were instructed to circle "remember" or "know."

Procedure

Participants assembled care packages, as described above, and then read the misinformation narrative. Subjects in the 10-minute delay condition then read an article as a distracter task until 10 minutes had passed since the care package assembly. Finally, the questionnaire was administered. Subjects in the 1-week delay condition were dismissed immediately after reading the misinformation narrative and completed the questionnaire during a second session 1 week later.

Results and Discussion

Accuracy data were analyzed using 2 × 3 mixed MANOVA tests, where delay (10 minutes or 1 week) varied at 2 levels between-subjects and question type (control, contradictory, or additive misinformation) varied at 3 levels within-subjects. All tests were significant with $p < .05$, and Bonferroni corrections were applied to the non-adjusted, pairwise p value obtained for multiple t-tests when performed within the same experiment. Mean proportion correct, false alarm rates, and proportion of RK judgments as a function of delay and question type are shown in Table 1, below.

Table 1
Mean Accuracy and False Alarm rates (Total) in Experiment 1, with proportion of Remember and Know responses for each question type, at 10 minute and 1 week delays.

		Hits			*False Alarms*		
Delay	*Quest Type*	*Total*	*P (Remem)*	*P(Know)*	*Total*	*P (Remem)*	*P(Know)*
10 min	Control	.87 (.03)	.78	.22	.12 (.03)	.23	.77
	Misinfo(C)	.73 (.04)	.68	.32	.16 (.03)	.77	.23
	Misinfo(A)	.79 (.05)	.45	.55	.07 (.03)	.25	.74
1 week	Control	.71 (.04)	.67	.33	.25 (.04)	.31	.69
	Misinfo(C)	.42 (.04)	.60	.40	.31 (.04)	.49	.51
	Misinfo(A)	.44 (.05)	.36	.64	.17 (.03)	.36	.64

False alarms were defined not just as an incorrect answer, but selecting the answer that was suggested in the misinformation; as such, they are only defined for misinformation items. Although false alarms are negatively correlated with accuracy, they are not non-independent. Accuracy refers to the likelihood of an error, and false alarms look at the composition of those errors—whether participants selected suggested information as opposed to the other 4 non-presented, non-suggested alternatives. False alarms (to suggested information), therefore, were analyzed using a 2 × 2 (delay by misinformation condition) MANOVA.

The average within-subject accuracy rate decreased after a 1-week delay across both misinformation conditions, F (1,117) = 43.92; η^2 = .27. As would be expected, delay and misinformation type interacted; responses were less accurate with a combination of delay and misinformation, F (2, 116) = 3.46; η^2 = .06. Planned comparisons between misinformation conditions at both delays confirmed that accuracy in both misinformation conditions was lower than in the control condition, but the two misinformation conditions did not differ from one another; longer delays produced larger misinformation effects. In fact, subjects identified suggested material at least twice as often following a delay. In addition, the relatively high levels of accuracy at shorter delays, especially in the control condition, suggests misinformation did not create new memories for suggested details, but rather altered existing memories; in the absence of misinformation, performance remained above 70%.

Overall, false alarms to suggested information increased with delays, F (1, 117) = 12.98; η^2 = .10. Furthermore, contradictory misinformation produced higher false alarm rates than did additive misinformation, F (1, 117) = 10.16; η^2 = .10. The interaction between delay and misinformation type was non-significant.

Proportions of RK judgments were analyzed with respect to misinformation and delay conditions using Chi-square analyses. Proportion of RK judgments did not differ for accurate responses or false alarms. False alarms made after 1 week are just as likely "remembered" as "known," and the same trend was found for accurate responses as well. Much as confidence ratings generally do not differ significantly for correct and incorrect responses, RK judgments did not reliably distinguish between them either.

In Experiment 1, misinformation effects over a delay occurred for both contradictory and additively suggested material, and subjects rated both accurate and false alarms "remembered" or "known" equally as often. Previous study of RK judgments and confidence indicates that RK judgment varies either as a function of confidence, or independently of confidence, which led to the following questions: Would asking subjects to make concurrent confidence ratings, in addition to RK judgments, lead to reliable predictions? That is, can either (or both) of these subjective assessments be used to distinguish correct from incorrect responses? In Experiment 2 we investigated those questions.

EXPERIMENT 2

With one key difference, the procedures used in Experiment 2 mirrored those in Experiment 1. In addition to collecting RK judgments, we asked participants to provide a post-test confidence judgment. (In almost every case, post-test confidence judgments correlated more highly with performance than pre-test confidence judgments, see Maki, 1998, for a discussion of this issue). As in Experiment 1, participants saw three types of post-event information (control/confirming information, contradictory misinformation, or additive misinformation) and two delay conditions (10 minutes or 1 week). Would confidence ratings distinguish accuracy better than RK judgments? Is RK judgment being interpreted as a dimension of confidence instead of a measure of recollective experience? If this were the case, following accepted conventions of the continuum-based theories that

"remember" responses are indicative of higher-confidence responding and vice-versa for "know" responses, one would anticipate a higher proportion of "remember" than "know" judgments for responses that are more confidently reported, and a higher proportion of "know" than "remember" judgments for responses less confidently reported. In contrast, dual-process theories of RK judgment would predict that the same trends in proportions of RK judgments would be found in the presence of concurrent confidence ratings as were found in Experiment 1: that RK judgment would vary independently of confidence (see Algarabel, Gotor, & Pitarque, 2003; Brewer & Sampaio, 2006; Dunn, 2004; Rajaram et al., 2002; Rotello & Macmillan, 2006; Rotello, Macmillan, & Reeder, 2004; Rotello & Zeng, 2008, for a high-level discussion of these issues).

Method

Participants

One hundred-nineteen undergraduate students from Baylor University volunteered their participation in return for course credit. Experimental sessions were carried out in groups of five subjects. At the conclusion of each session, subjects were debriefed on the experimental objective of the care package assembly activity.

Materials

The same materials were used in Experiment 2 as in Experiment 1, with one exception. Following each question on the recognition task, subjects were not only asked to make an RK judgment, but were also asked, "How confident are you that your answer is correct," and were instructed to circle one of six confidence ratings ranging from 0% to 100% in 20% increments.

Procedure

The procedure employed in Experiment 2 is the same as that used in Experiment 1, with the addition of the post-test confidence judgment.

Results and Discussion

As in Experiment 1, accuracy data were analyzed using 2 × 3 MANOVA, with delay manipulated between-subjects and post-event information varied within-subjects. Table 2 (next page) displays means for proportion correct, false alarms, and the distribution of RK judgments.

Not surprisingly, accuracy declined with delays, $F(1, 136) = 49.13$; $\chi^2 = .27$; as before, delay and misinformation type interacted, with large declines in accuracy produced by a combination of delay and misinformation, $F(2, 135) = 4.16$; $\chi^2 = .09$. Accuracy declined over the delay, but the decline was larger in the two misinformation conditions. With respect to false alarms, a 2 × 2 MANOVA confirms a significant effect of delay on the average within-subject false alarm rates across misinformation conditions, $F(1, 136) = 9.19$; $\chi^2 = .06$. Although subjects committed more false alarms following contradictory misinformation questions, this difference was not significant ($p < .10$), nor was the interaction.

Table 2
Mean Accuracy and False Alarm rates (Total) in Experiment 2, with proportion of Remember and Know responses for each question type, at 10 minute and 1 week delays.

		Hits			*False Alarms*		
Delay	*Quest Type*	*Total*	*P (Remem)*	*P(Know)*	*Total*	*P (Remem)*	*P(Know)*
10 min	Control	.84 (.04)	.70	.30	.15 (.04)	.35	.65
	Misinfo(C)	.64 (.04)	.59	.41	.19 (.04)	.48	.52
	Misinfo(A)	.75 (.04)	.47	.53	.10 (.03)	.15	.85
1 week	Control	.70 (.04)	.65	.35	.26 (.03)	.47	.53
	Misinfo(C)	.40 (.04)	.61	.39	.27 (.04)	.57	.43
	Misinfo(A)	.39 (.04)	.56	.44	.24 (.04)	.51	.49

Figure 1 (below) displays the proportion of "Remember" responses for hits and false alarms, for each level of confidence. In general, higher levels of confidence were assigned to those responses judged as "remembered." Critically, however, this was true not just for hits but also for false alarms. Misinformation produced not only higher false alarm rates, but increased the confidence of these errors.

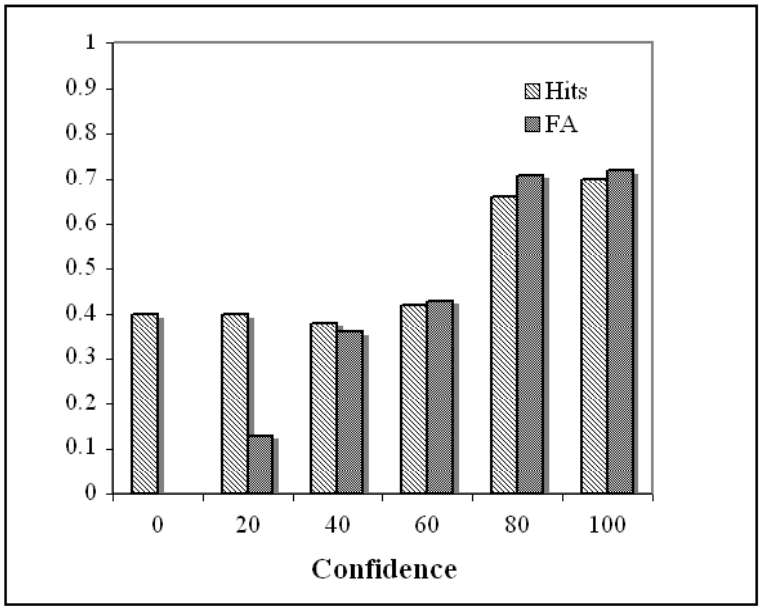

Figure 1. Proportions of "remember" judgments for hits and false alarm responses by confidence across all misinformation conditions in Experiment 2.

We analyzed the accuracy of subjective assessments (confidence and RK judgments) at the 1-week delay in several ways. We compared the mean confidence ratings for accurate responses with those for inaccurate responses, across all three post-event information conditions, referred to as *resolution* (or *discrimination*) in the metacognition literature (see Kelemen, Frost, & Weaver, 2000; Koriat, 2007; Weaver, Terrell, Krug, & Kelemen, 2008). Overall, participants were somewhat more confident on accurate responses (69%) than inaccurate responses (50%), F (1, 436) = 58.9. Likewise, participants were somewhat more likely to assign "remember" responses to accurate responses (51%) than to inaccurate ones (39%), F (1, 436) = 6.7. The magnitude of these effects, however, was relatively small, as seen in follow-up discriminant analysis. Essentially, this allows one to determine whether knowing something about the classification variables (in this case, confidence and RK judgments) allows one to make predictions about the accuracy of a given response.

Discriminant analyses confirmed two things: first, that while confidence ratings and RK judgments (separately) can discriminate responses, using both (simultaneously) does not improve beyond either one separately. That is, while not perfectly correlated, they do not provide unique and useful ways of discriminating accuracy: using both predictor variables, classification accuracy at 1-week delays was 64.2%. Using only confidence alone was nearly as good at 63.2%. These results contradict the widely reported (though technically inaccurate) notion that confidence is entirely unrelated to witness accuracy. Our findings are more consistent with the notion that confidence is modestly related to accuracy, under some conditions. This may be related to the encoding instruction, whereby the experimental nature of the study was kept from subjects until after test. That is, for information incidentally encountered, our participants exhibited better confidence/accuracy resolution than in other studies where subjects, presumably, know that viewing a crime scene on film or slides is done in the context of psychological research (and inflate their estimates accordingly). At the same time, our participants were frequently very confident for misremembered information: confidence and "remember" responses remained high for false alarms to suggested material as well.

GENERAL DISCUSSION

The factors contributing to errors in eyewitness memory, especially those reported long after encoding, are well known (Weaver et al., 2006). In both experiments, accuracy of responses decreased by half and false alarms for suggested information doubled over a 1-week delay for both misinformation conditions. These data present a clear answer to a question among eyewitness researchers: Does misinformation *replace* older, correct information, or does it simply distort responding, acting as a demand characteristic? Given the high level of accuracy in the control condition following a 1-week delay, and the magnitude of the misinformation effects, we argue these effects are due to genuine acceptance of the misinformation (Weingardt, Loftus, & Lindsay, 1995; Weingardt, Toland, & Loftus, 1994; Zaragoza, Belli, & Payment, 2007)

Consistently high proportions of "remember" judgments were made for both accurate and false alarm responses that were also rated with higher confidence. Not surprisingly,

70% of accurate responses rated with 80% and 100% confidence were associated with "remember" judgments. However, 75% of false alarm responses (product brands suggested to subjects on the misinformation narrative) rated with 80% and 100% confidence were also judged "remembered." That is, subjects who were confidently recognizing their experience with suggested material were also consciously recollecting the experience. This suggests that, when recognizing suggested material, recollective judgment may be an important source of confidence. Our findings are consistent with those of Frost (2000), who reported that misinformation was more likely to be judged "remembered." However, we also found those same responses were assigned high confidence, suggesting that RK assessments provide little additional information to aid in distinguishing accurate responses.

As with all laboratory studies, our results have limitations. Identifying names of products differs in some ways from identification of suspects, both in terms of pre-existing familiarity and also with respect to significance (e.g., affect) of the information being encoded. We make no strong claims about the relative comparability of witness accuracy in these two situations. Rather, our findings address the issue of the relationship between subjective assessments of confidence and witness accuracy. The *processes* involved in generating subjective assessments, we contend, are largely similar regardless of the content of the information being tested or even the population from which witnesses are taken.

Confident witnesses can be persuasive. This is troubling when one takes into account the general assertion by the eyewitness memory literature that the relationship between confidence and accuracy is weak to nonexistent (see Krug, 2007 for a review). One source of this confidence, as demonstrated here, is a mistaken sense of recollection: subjects genuinely remember experiencing things that are demonstrably false. Any number of variables have been used to distinguish more accurate witnesses from those who are less accurate. Subjective assessments, whether in the form of confidence judgments or RK judgments, are of limited use in this regard. These findings lend empirical support to the notion that memory for information one encountered in the past may not be accurate (indeed, they may be even more likely to be false) following encounters with refreshing materials intended to guide a witness toward a particular response, even if that erroneous response is reported with high levels of subjective confidence and recollection.

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