What follows is a selection of short review papers from the journal *Current Directions in Psychological Science*. The first two articles are older articles that appeared in that journal a decade or two ago. The second two, are articles from the same labs (The Wells and Loftus labs) that appeared in the February 2011 *Special Issue on Psychology and the Law* of that journal. If you are interested in psychology and the law, this special issue may be of interest to you (http://cdp.sagepub.com/content/20/1).

The papers that follow are:


When A Lie Becomes Memory's Truth:
Memory Distortion After Exposure to
Misinformation

Elizabeth F. Loftus

What happens when people witness an event, say, a crime or accident, and are later exposed to new information about that event? Two decades of research have been devoted to the influence of new information on the recollections of such witnesses. An all-too-common finding is that after receipt of new information that is misleading in some way, people make errors when they report what they saw. New, postevent information often becomes incorporated into a recollection, supplementing or altering it, sometimes in dramatic ways. New information invades us, like a Trojan horse, precisely because we do not detect its influence. Understanding how we become tricked by revised data about a witnessed event is a central goal of this research.

Current research showing how memory can become skewed when people assimilate new data utilizes a simple paradigm. Participants first witness a complex event, such as a simulated violent crime or automobile accident. Subsequently, half the participants receive new, misleading information about the event. The other half do not get any misinformation. Finally, all participants attempt to recall the original event. In a typical example of a study using this paradigm, participants saw a simulated traffic accident. They then received written information about the accident, but some people were misled about what they saw. A stop sign, for instance, was referred to as a yield sign. When asked whether they originally saw a stop or a yield sign, participants given the phony information tended to adopt it as their memory; they said they saw a yield sign. In these and many other experiments, people who had not received the phony information had much more accurate memories. In some experiments, the deficits in memory performance following receipt of misinformation have been dramatic, with performance differences as large as 30% or 40%.

This degree of distorted reporting has been found in scores of studies, involving a wide variety of materials. People have recalled seeing nonexistent items, such as broken glass, tape recorders, and even something as large and conspicuous as a barn (in a bucolic scene that contained no buildings at all), and have recalled incorrect traits for items they did see, such that a clean-shaven man developed a mustache, straight hair became curly, a stop sign became a yield sign, and a hammer became a screwdriver. In short, misleading postevent information can alter a person's recollection in a powerful, even predictable, manner.

The change in report arising after receipt of misinformation is often referred to as the misinformation effect. Four questions about the misinformation effect have occupied the attention of researchers:

1. When are people particularly susceptible to the damaging influence on recollection of misleading information, and when are people particularly resistant?

2. What groups of people are particularly prone to having their recollections be modified, and what groups are resistant?

3. Does misinformation actually impair a person's ability to remember details of an event? Put another way, what happens to the original memory after exposure to misinformation?

4. Do people genuinely believe in the misinformation?

WHEN ARE PEOPLE SUSCEPTIBLE TO MISINFORMATION?

A growing body of studies reveals the conditions that make people particularly susceptible to the influence of misinformation. For example, people are particularly prone to having their memories modified when the passage of time allows the original memory to fade. Put another way, with a long interval between the event and the misinformation, the injection of misinformation becomes relatively easy. In its weakened condition, memory—like the disease-ridden body—becomes especially vulnerable to repeated assaults on its very essence. This finding leads us to a principle, the discrepancy detection principle, for determining when changes in recollection will occur.

Recollections are more likely to change if a person does not immediately detect discrepancies between postevent information and memory for the original event.

Other lines of research fit well with the discrepancy detection principle. For example, if people are exposed to misinformation that is sub-

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tle, they are more likely to be influenced than if the misinformation is not subtle. Consider the simple interrogative sentence "Was the mustache worn by the tall intruder light or dark brown?" This sentence not so subtly suggests the existence of a mustache. By comparison, "Did the intruder who was tall and had a mustache say anything to the professor?" is more subtle in its suggestion of the mustache, having embedded this idea in a relative clause. People are more likely to falsely claim that they saw a mustache when exposed to the more subtle version.

Another line of research that fits well with the discrepancy detection principle involves explicit warnings. If people are warned prior to a postevent narrative that the narrative may be misleading, they are better able to resist its influence than if they are not warned. In these various lines of research, the subject's detection of discrepancies between the original memory and the postevent passage (or failure to detect discrepancies) appears to be crucial. With a long interval between event and misinformation, and with misinformation that is subtly embedded, the ability of subjects to detect a discrepancy is minimized. In contrast, when subjects are warned about the likelihood of incorrect information, they scrutinize the postevent information, and the likelihood of detection of a discrepancy is enhanced. It is also true that people are particularly susceptible if they can be induced to repeat the misinformation as fact.

WHO IS SUSCEPTIBLE TO MISINFORMATION?

The majority of the studies of the misinformation effect have been conducted with college students, and few individual difference variables have emerged. Where group differences do emerge is in misinformation studies using children as subjects. It is common (although not universal) to find that young children are especially susceptible to these manipulations.4 The largest study of individual differences was recently conducted with nearly 2,000 people who were attending a science museum in San Francisco.5 The experiment was one of the interactive exhibits at the museum, which means that subjects provided data for the experiment while learning from the exhibit. All subjects watched a short film clip and later answered a series of questions about it. Some subjects were exposed to misleading questions but others were not, so that the impact of misinformation could be assessed. The most important demographic variable was the age of the subject, which varied between 5 and 75. Memory performance rose as a function of age up to the 20s, leveled off, and then fell sharply for subjects over age 65. Moreover, the youngest and the oldest groups showed large misinformation effects. Put another way, the very young and the elderly were significantly more accurate when not misinformed than when misinformed, a result that is consistent with other age effects in the literature on episodic memory. The article describing the study also reviews relevant literature on individual differences in susceptibility to misinformation.5

WHAT HAPPENS TO THE ORIGINAL MEMORY?

An important issue that has been debated is whether misinformation actually impairs a person's ability to remember details of an event. Put another way, are memory traces altered by postevent misinformation? There are several ways in which misinformation could impair memory. First, misinformation could cause trace impairment; that is, it could update or alter the previously formed memory. New information could combine with earlier traces to change the representation. Second, misinformation could cause retrieval impairment; that is, misinformation could make the original memory trace less accessible without altering it.6 Impairment of some sort is implied by either the trace impairment or the retrieval impairment mechanism.

Some theorists have rejected the notion that misinformation impairs memory. McCloskey and Zaragoza7 disagreed with the idea that the misinformation effect is due to recoding processes or updating of previously stored memories or arises because inhibition or suppression renders the older memory less accessible. McCloskey and Zaragoza argued instead that the misinformation does not affect memory at all, but merely influences the reports of subjects who have never encoded (or do not recall) the original event. Instead of guessing blindly, these subjects use the misinformation to decide what to report as their memory. Misinformation effects could also be obtained if subjects remember both sources of information but select the misleading information because they conclude it must be correct.

Several lines of evidence support the notion that misinformation occasionally does impair the ability to remember original details, however. One kind of evidence involves studies using tests that do not permit the misinformation option. Say a subject originally saw a stop sign, but it was later referred to as a yield sign. Suppose we now give the subject a test that does not permit the selection of the yield sign (e.g., the choice is between a stop sign and a no-parking sign). If the misinformation has impaired memory for the stop sign, then the misinformed subjects would be less likely to remember the stop sign than the control subjects. If there has been no memory impairment due to misinformation, then misled subjects would be expected to be as accurate as control subjects on a test of this type. Although some
CONCLUDING REMARKS

Misleading information can turn a lie into memory's truth. It can cause people to believe that they saw things that never really existed, or that they saw things differently from the way things actually were. It can make people confident about these false memories and also, apparently, impair earlier recollections. Once adopted, the newly created memories can be believed as strongly as genuine memories. If handled skillfully, the power of misinformation is so enormous and sufficiently controllable that a colleague and I recently postulated a not-too-distant "brave new world" in which misinformation researchers would be able to proclaim: "Give us a dozen healthy memories . . . and our own specified world to handle them in. And we'll guarantee to take any one at random and train it to become any type of memory that we might select . . . regardless of its origin or the brain that holds it." 12 The implications of these findings for the legal field, for advertising, for political persuasion, and for clinical settings are far-reaching.

Notes

1. The author's research described in this article was supported by grants from the National Institute of Mental Health, the National Science Foundation, and the U.S. Department of Transportation.


12. Loftus and Hoffman, note 3, p. 103.
The Confidence of Eyewitnesses in Their Identifications From Lineups

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Abstract
The confidence that eyewitnesses express in their lineup identifications of criminal suspects has a large impact on criminal proceedings. Many convictions of innocent people can be attributed in large part to confident but mistaken eyewitnesses. Although reasonable correlations between confidence and accuracy can be obtained under certain conditions, confidence is governed by some factors that are unrelated to accuracy. An understanding of these confidence factors helps establish the conditions under which confidence and accuracy are related and leads to important practical recommendations for criminal justice proceedings.

Keywords
eyewitness testimony; lineups; eyewitness memory

Mistaken identification by eyewitnesses was the primary evidence used to convict innocent people whose convictions were later overturned by forensic DNA tests (Scheck, Neufeld, & Dwyer, 2000; Wells et al., 1998). The eyewitnesses in these cases were very persuasive because on the witness stand they expressed extremely high confidence that they had identified the actual perpetrator. Long before DNA exoneration cases began unfolding in the 1990s, however, eyewitness researchers in psychology were finding that confidence is not a reliable indicator of accuracy and warning the justice system that heavy reliance on eyewitness's confidence in their identifications might lead to the conviction of innocent people.

Studies have consistently demonstrated that the confidence an eyewitness expresses in an identification is the major factor determining whether people will believe that the eyewitness made an accurate identification. The confidence an eyewitness expresses is also enshrined in the criteria that the U.S. Supreme Court used 30 years ago (and that now guide lower courts) for deciding the accuracy of an eyewitness's identification in a landmark case. Traditionally, much of the experimental work examining the relation between confidence and accuracy in eyewitness identification tended to frame the question as "What is the correlation between confidence and accuracy?" as though there were some single, true correlation value. Today, eyewitness researchers regard the confidence-accuracy relation as something that varies across circumstances. Some of these circumstances are outside the control of the criminal justice system, but some are determined by the procedures that criminal justice personnel control.

A GENERAL FRAMEWORK FOR CONFIDENCE-ACCURACY RELATIONS

It has been fruitful to think about eyewitness accuracy and eyewitness confidence as variables that are influenced by numerous factors, some of which are the same and some of which are different. We expect confidence and accuracy to be more closely related when the variables that are influencing accuracy are also influencing confidence than when the variables influencing accuracy are different from those influencing confidence. Consider, for instance, the variable of exposure duration (i.e., how long the eyewitness viewed the culprit while the crime was committed). An eyewitness who viewed the culprit for a long time during the crime should be more accurate than one who had only a brief view. Furthermore, the longer view could be a foundation for the eyewitness to feel more confident in the identification, either because the witness has a more vivid and fluent memory from the longer duration or because the witness infers his or her accuracy from the longer exposure duration. Hence, the correlation between confidence and accuracy should be higher the more variation there is in the exposure duration across witnesses (Read, Vokey, & Hammersley, 1990). Suppose, however, that some eyewitnesses were reinforced after their identification decision (e.g., "Good job. You are a good witness."), whereas others were given no such reinforcement. Such postidentification reinforcement does nothing to make witnesses more accurate, but dramatically inflates their confidence (Wells & Bradfield, 1999).

Eyewitness confidence can be construed simply as the eyewitness's belief, which varies in degree, about whether the identification was accurate or not. This belief can have various sources, both internal and external, that need not be related to accuracy. Shaw and his colleagues, for example, have shown that repeated questioning of eyewitnesses about mistaken memories does not make the memories...
more accurate but does inflate the eyewitnesses’ confidence in those memories (Shaw, 1996; Shaw & McLure, 1996). Although the precise mechanisms for the repeated-questioning effect are not clear (e.g., increased commitment to the mistaken memory vs. increased fluidity of the response), these results illustrate a dissociation between variables affecting confidence and variables affecting accuracy.

It is useful to think about broad classes of variables that could be expected to drive confidence and not accuracy, or to drive accuracy and not confidence, or to drive both variables. It is even possible to think about variables that could decrease accuracy while increasing confidence. Consider, for instance, coincidental resemblance. Mistaken identifications from lineups occur primarily when the actual culprit is not in the lineup. Suppose there are two such lineups, one in which the innocent suspect does not highly resemble the real culprit and a second in which the innocent suspect is a near clone (coincidental resemblance) of the real culprit. The second lineup will result not only in an increased rate of mistaken identification compared with the first lineup, but also in higher confidence in that mistake. In this case, a variable that decreases accuracy (resemblance of an innocent suspect to the actual culprit) serves to increase confidence.

THE CORRELATION, CALIBRATION, AND INFLATION OF CONFIDENCE

Although many individual studies have reported little or no relation between eyewitnesses’ confidence in their identifications and the accuracy of their identifications, an analysis that statistically combined individual studies indicates that the confidence-accuracy correlation might be as high as +.40 when the analysis is restricted to individuals who make an identification (vs. all witnesses; see Sporer, Penrod, Read, & Cutler, 1995). How useful is this correlation for predicting accuracy from confidence? In some ways, a correlation of .40 could be considered strong. For instance, when overall accuracy is 50%, a .40 correlation would translate into 70% of the witnesses with high confidence being accurate and only 30% of the witnesses with low confidence being accurate. As accuracy deviates from 50%, however, differences in accuracy rates between witnesses with high and low confidence will diminish even though the correlation remains 40.

Another way to think about a .40 correlation is to compare it with something that people experience in daily life, namely the correlation between a person’s height and a person’s gender. Extrapolating from males’ and females’ average height and standard deviation (69.1, 63.7, and 5.4 in., respectively; Department of Health and Human Services, n.d.) yields a correlation between height and gender of +.43. Notice that the correlation between height and gender is quite similar to the correlation between eyewitnesses’ identification confidence and accuracy. Thus, if eyewitnesses’ identifications are accurate 50% of the time, we would expect to encounter a highly confident mistaken eyewitness (or a nonconfident accurate eyewitness) about as often as we would encounter a tall female (or a short male).

Although the eyewitness-identification literature has generally used correlation methods to express the statistical association between confidence and accuracy, it is probably more forensically valid to use calibration and overconfidence/underconfidence measures rather than correlations (Brewer, Keast, & Rishworth, 2002; Juslin, Olson, & Winman, 1996). In effect, the correlation method (specifically, point-biserial correlation) expresses the degree of statistical association by calculating the difference in confidence (expressed in terms of the standard deviation) between accurate and inaccurate witnesses. Calibration, on the other hand, assesses the extent to which an eyewitness’s confidence, expressed as a percentage, matches the probability that the eyewitness is correct. Overconfidence reflects the extent to which the percentage confidence exceeds the probability that the eyewitness is correct (e.g., 80% confidence and 60% probability correct), and underconfidence reflects the extent to which the percentage confidence underestimates the probability that the eyewitness is correct (e.g., 40% confidence and 60% probability correct). Juslin et al. pointed out that the confidence-accuracy correlation can be quite low even when calibration is high.

Work by Juslin et al. (1996) indicates that eyewitnesses can be well calibrated at times, but recent experiments (Wells & Bradfield, 1999) illustrate a problem that can arise when trying to use percentage confidence expressed by witnesses to infer the probability that their identifications are accurate. In a series of experiments, eyewitnesses were induced to make mistaken identifications from lineups in which the culprit was absent and were then randomly assigned to receive confirming “feedback” telling them that they identified the actual suspect or to receive no feedback at all. Later, these witnesses were asked how certain they were at the time of their identification (i.e., how certain they were before the feedback). Those who did not receive confirming feedback gave average confidence ratings of less than 50%, but those receiving confirming feedback gave average confidence ratings of

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over 70%. Because all of these eyewitnesses had made mistaken identifications, even the no-feedback witnesses were overconfident, but the confirming-feedback witnesses were especially overconfident. Confidence inflation is a difficult problem in actual criminal cases because eyewitnesses are commonly given feedback about whether their identification decisions agree with the investigator’s theory of the case. In these cases, it is the detective, rather than the eyewitness, who determines the confidence of the eyewitness.

Confirming feedback not only inflates confidence, thereby inducing overconfidence, but also harms the confidence-accuracy correlation. When eyewitnesses are given confirming feedback following their identification decisions, the confidence of inaccurate eyewitnesses is inflated more than is the confidence of accurate eyewitnesses, and the net result is a reduction in the confidence-accuracy correlation (Bradfield, Wells, & Olson, 2002). Hence, although the confidence of an eyewitness can have utility if it is assessed independently of external influences (e.g., comments from the detective, learning about what other eyewitnesses have said), the legal system rarely assesses confidence in this way.

**IMPACT ON POLICIES AND PRACTICES**

What impact has research on the confidence-accuracy problem had on the legal system? Until relatively recently, the impact has been almost nil. However, when DNA exoneration cases began unfolding in the mid-1990s, U.S. Attorney General Janet Reno initiated a study of the causes of these miscarriages of justice. More than three fourths of these convictions of innocent persons involved mistaken eyewitness identifications, and, in every case, the mistaken eyewitnesses were extremely confident and, therefore, persuasive at trial (Wells et al., 1998). A Department of Justice panel used the psychological literature to issue the first set of national guidelines on collecting eyewitness identification evidence (Technical Working Group for Eyewitness Evidence, 1999). One of the major recommendations was that the confidence of the eyewitness be assessed at the time of the identification, before there is any chance for it to be influenced by external factors.

The state of New Jersey has gone even further in adopting the recommendations of eyewitness researchers. Based on findings from the psychological literature, guidelines from the attorney general of New Jersey now call for double-blind testing with lineups. Double-blind lineup testing means that the person who administers the lineup does not know which person in the lineup is the suspect and which ones are merely fillers. Under the New Jersey procedures, the confidence expressed by the eyewitness will be based primarily on the eyewitness’s memory, not on the expectations of or feedback from the lineup administrator.

There is growing evidence that the legal system is now beginning to read and use the psychological literature on eyewitnesses to formulate policies and procedures. The 2002 report of Illinois Governor George Ryan’s Commission on Capital Punishment is the latest example of this new reliance on the psychological literature. The commission specifically cited the literature on the problem with confidence inflation and recommended double-blind testing and explicit recording of confidence statements at the time of the identification to prevent or detect confidence inflation (Illinois Commission on Capital Punishment, 2002).

**NEW DIRECTIONS**

Although the psychological literature on eyewitness identification has done much to clarify the confidence-accuracy issue and specify some conditions under which confidence might be predictive of accuracy, research has started to turn to other indicators that might prove even more predictive of accuracy. One of the most promising examples is the relation between the amount of time an eyewitness takes to make an identification and the accuracy of the identification. Eyewitnesses who make their identification decision quickly (in 10 s or less) are considerably more likely to be accurate than are eyewitnesses who take longer (e.g., Dunning & Peretta, in press). Confidence is a self-report that is subject to distortion (e.g., from postidentification feedback), whereas decision time is a behavior that can be directly observed. Hence, decision time might prove more reliable than confidence as an indicator of eyewitness accuracy. Yet another new direction in eyewitness identification research concerns cases in which there are multiple eyewitnesses. Recent analyses show that the behaviors of eyewitnesses who do not identify the suspect from a lineup can be used to assess the likely accuracy of the eyewitnesses who do identify the suspect from a lineup (Wells & Olson, in press). The future of eyewitness identification research is a bright one, and the legal system now seems to be paying attention.

**Recommended Reading**


Evolutionary Psychology of Facial Attractiveness

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Abstract

The human face communicates an impressive number of visual signals. Although adults' ratings of facial attractiveness are consistent across studies, even cross-culturally, there has been considerable controversy surrounding attempts to identify the facial features that cause faces to be judged attractive or unattractive. Studies of physical attractiveness have attempted to identify the features that contribute to attractiveness by studying the relationships between attractiveness and (a) symmetry, (b) averageness, and (c) nonaverage sexually dimorphic features (hormone markers). Evolutionary psychology proposes that these characteristics all pertain to health, suggesting that humans have evolved to view certain features as attractive because they were displayed by healthy individuals. However, the question remains how single features that are considered attractive relate to each other, and if they form a single ornament that signals mate quality. Moreover, some researchers have recently explained attractiveness preferences in terms of individual differences that are predictable. This article briefly describes what is currently known from attractiveness research, reviews some recent advances, and suggests areas for future researchers' attention.

Keywords

face; attractiveness; mate choice; evolutionary psychology

An obsession with beauty is not unique to modern Western culture but can be found around the world in almost all societies that have been studied. Several studies have shown that members of different ethnic groups share common attractiveness standards, suggesting that the constituents of beauty are neither

References


Note

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Published by Blackwell Publishing Inc.
Eyewitness Identification

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Abstract
Eyewitness identifications play an important role in many police investigations and courtroom decisions. Identification decision accuracy is shaped not only by the quality of a witness’s memory but also by social-influence variables. Some variables can be categorized as general impairments, whereas others produce biases against a specific suspect. We review some of the key variables in each category and consider postidentification indicators of identification accuracy. Finally, we highlight what we think are some of the major directions for future research. These include addressing some of the significant limitations of past research, examining variables that are not directly related to memory or social influence, and developing some radical new directions for identification tests.

Keywords
eyewitness identification, eyewitness memory, confidence

Witnesses to crimes are sometimes asked to view a police lineup to see if they can identify the culprit. Using experimentally created events, psychological researchers have long warned that eyewitness identification evidence is less reliable than people seem to believe. Corroborating the concerns of psychologists, since the advent of forensic DNA testing in the 1990s, 258 people convicted by juries in the United States have been freed based on exculpatory DNA tests, and 200 of these were cases of mistaken eyewitness identification (Innocence Project, 2010). Examination of the reasons for these mistaken identifications has provided rich avenues of investigation guided by cognitive and social perspectives. Here we focus on (a) variables that produce general impairments of identification accuracy, (b) postidentification indicators of identification accuracy, and (c) variables that result in biases against the suspect.

General Impairments of Identification Performance
Numerous variables have been shown to shape (a) whether witnesses make positive or negative lineup decisions (i.e., choices or rejections) and (b) the accuracy of those decisions. Not surprisingly, witnesses are likely to assume that the culprit is in the lineup; when explicitly warned that the lineup may or may not contain the culprit, witnesses are less likely to make a selection (Brewer & Wells, 2006). Identification accuracy is impaired under encoding conditions likely to undermine memory strength, such as divided attention, short exposure duration, and long viewing distance (e.g., Lindsay, Semmler, Weber, Brewer, & Lindsay, 2008; Palmer, Brewer, McKinnon, & Weber, 2010). Some conditions, such as identifying a culprit of a different race or one who was wearing a disguise (e.g., Meissner & Brigham, 2001), undermine encoding and/or lineup discrimination performance. Other conditions such as lengthy retention intervals are associated with diminished memory strength (Deffenbacher, Bornstein, McGorty, & Penrod, 2008).

Indicators of Identification Accuracy
Because an identification decision is often the key evidence against a suspect, characteristics of identification decisions that might discriminate accurate from inaccurate decisions have been explored. Decision confidence (Brewer & Wells, 2006), latency (Weber, Brewer, Wells, Semmler, & Keast, 2004) and phenomenological reports (Palmer et al., 2010) have all been found to discriminate for positive decisions but not for lineup rejections. Highly confident decisions, rapid decisions, and decisions accompanied by relevant recollection (i.e., recall of contextual information relevant to discriminating the culprit) are more likely to be accurate than are decisions made with low confidence, slowly, or without relevant recollection.

Although we cannot specify absolute latencies or amounts of relevant recollection associated with accurate decisions,
eyewitness confidence can provide a valuable pointer to the accuracy of an individual identification decision. It is not uncommon for psychologists to express the view that there is no meaningful relation between confidence and accuracy for identifications, a position based on the usually modest (at best) confidence–accuracy (CA) correlations that have been reported. However, recent research has shown that the CA correlation does not provide a comprehensive picture of the CA relation. Researchers who have used a calibration approach (which involves charting the proportion of accurate responses for each confidence level) to assess the CA relation across a variety of stimuli, exposure and attention conditions, and retention intervals, have shown that, when measured immediately after an identification, confidence does provide a meaningful guide as to the likely accuracy of decisions made by adult (but not child) witnesses (Brewer & Wells, 2006; Keast, Brewer, & Wells, 2007; Sauer, Brewer, Zweck, & Weber, 2010)—a finding that is at odds with oft-stated positions in the literature. These research outcomes signal that police investigators should attend carefully to witness confidence when evaluating whether an identified suspect warrants continued investigation or whether they should perhaps target other possible suspects.

Confidence is not, however, an infallible index of accuracy. The calibration research summarized above indicates that, under many conditions, very high levels of confidence may exceed the probability of an accurate identification, with confidence levels of 90% to 100% often associated with lower accuracy rates around 75% to 90%. Further, as we discuss later, confidence breaks down as a marker of accuracy under certain conditions.

Variables Known to Produce Specific Suspect Biases

Eyewitness researchers have found it useful to distinguish between variables that impact general performance (as in the previous section) and variables that create a specific bias against the suspect (Wells & Loftus, 2003). Poor lighting conditions or cross-racial identification situations, for example, impair eyewitness identification performance, but no more so for one member of a lineup (e.g., one of the fillers) than for another (e.g., the suspect). Of course, the suspect might or might not be the perpetrator, so any factors that bias witness responses toward the suspect are of great concern. Psychologists have long called for double-blind lineups to prevent the lineup administrator from inadvertently cueing the witness toward the suspect (Wells, 1988), but only recently have experiments more carefully teased apart these cueing dynamics (Clark, Marshall, & Rosenthal, 2009; Greathouse & Kovera, 2009). A powerful suspect-bias influence can also occur after the witness makes an identification if the witness receives confirming feedback (e.g., “Good, you identified the suspect”). Confirming postidentification feedback dramatically inflates witnesses’ reports of their certainty, view, attention, and other variables (Semmler, Brewer, & Wells, 2004; Wells, Olson, & Charman, 2003). Of course, an innocent suspect can stand out in a lineup for a variety of reasons, including the presence of fillers who do not fit the description of the culprit. But there are other variables that create bias against a suspect, such as misattributed familiarity. Misattributed familiarity can occur because of repeated identification procedures such as having seen the person in a mugshot search prior to a lineup or confusing a bystander with the perpetrator.

Understanding suspect-bias variables is an important direction in eyewitness identification research. In virtually every trial involving contested eyewitness identification, the to-be-explained issue is not merely why the witness has a weak memory or whether witnesses are unreliable. Instead, the question is, “Why did the witness choose the suspect, rather than one of the fillers, from the lineup?” General impairment variables play an important role, but only suspect-bias variables answer that question. Research examining this latter category of variables has yielded many practical guidelines for lineup conduct (Wells, Memon, & Penrod, 2006).

Some Major Directions

We identify four main research directions that we believe can advance this field. The first is not at all exciting, as it will involve researchers going back over some old ground. There is a tendency in this field to speak with certainty about the variables that explain the variations in identification performance. Yet we are not convinced that the knowledge base is as robust as is sometimes assumed. Traditionally, eyewitness identification experiments yield one data point per subject from either a culprit-present or a culprit-absent condition. Even with what may appear to be large sample sizes for psychology experiments, statistical power is a major, and often underestimated, issue, as has been clearly demonstrated by Brewer, Weber, and Semmler (2005). Additionally, the levels sampled for the independent variables are necessarily restricted, as is the range of stimuli sampled. Meta-analyses can address some of these issues, but when studies that have employed a same–different face recognition paradigm (to provide stimulus variability and more data points) are set aside, there are very few identification test studies examining specific variables (e.g., exposure duration). These limitations mean that we do not have detailed knowledge about the influence of individual variables or the likely complex interactions between variables, a point illustrated by Lindsay et al.’s (2008) field study, using multiple stimuli, of the effects of viewing distance (and other variables) on identification performance. One impediment to the sorts of studies we are calling for might appear to be the capacity to access sufficiently large participant samples. Several recent field studies (e.g., Lindsay et al., 2008; Sauer et al., 2010) reveal some effective and relatively inexpensive solutions to this problem.

Second, there is a relative dearth of work examining the interactions between general-impairment variables and suspect-bias variables. An emerging theoretical view is that suspect-bias variables have a more powerful influence when general-impairment variables are present (Charman & Wells,
In recent years, computational modeling has been applied to lineup identification behaviors, and this has been useful in fleshing out the assumptions behind some of the “mini-theories” that have been used to explain eyewitness identification errors (Clark, 2008). With a better data base of how general impairment variables and suspect-bias variables interact, these computational models could become more sophisticated and lead to better theories.

Third, there is an emerging type of research that is very important to eyewitness identification evidence in the real world that is not directly related to memory or to social influence yet is being conducted by psychologists. One example of such research concerns the influence of the base rate for which the actual culprit is in the lineup (e.g., does the culprit appear in 90% of lineups or 50% of lineups?). Psychologists have drawn attention to the fact that this base rate is an important factor in the chances of mistaken identification. Two other examples of important nonmemory variables relevant to mistaken identification have also been identified recently. One is the problem of estimating likelihoods of guilt based on the consistent and inconsistent behaviors of multiple witnesses to the same event. Clark and Wells (2008) used data from a wide variety of experiments to estimate how probabilities of guilt rise and fall as a function of agreement and disagreement among witnesses in their lineup identifications. More work needs to be done to take account of nonindependence among witnesses. Another example is the “pleading effect,” which results in vastly different chances of mistaken identifications to be expected at the lineup versus in the courtroom. Wells et al. (2006) noted that 85% of guilty suspects in the United States plead guilty. Therefore, suppose 95% of suspects who are identified from lineups are guilty and 5% are innocent. The pleading effect means that 85% of the 95% guilty will not go to trial whereas almost 100% of the 5% innocent will go to trial rather than plead guilty. Hence, the proportion of identified suspects going to trial who are innocent would be greater than 33%. These are not memory variables, but they are important to study because they have a great impact on our understanding of how to calculate the chances of mistaken identifications surfacing at various junctures in the justice system.

Fourth, with the exception of the development of sequential lineup (in which the witness views one lineup member at a time; Lindsay & Wells, 1985), the eyewitness identification research paradigm has seldom departed from the traditional simultaneous lineup (i.e., all lineup members appear together) used by police in criminal investigations. The extant lineup paradigm demands that witnesses either choose from among the members of the lineup or reject them, a decision that is influenced by an array of social and metacognitive variables independent of the witness’ memory strength and the degree of match between their memory and the lineup members. Although research has identified a number of procedural variables that can reduce error in the traditional lineup, experimental psychologists should be able to develop alternative procedures that provide a more sensitive index of the likelihood that the suspect is indeed the culprit. One example of such a procedure is Sauer, Brewer, and Weber’s (2008) use of patterns of witnesses’ confidence judgments to indicate the lineup member who most resembles the culprit and whether that person is the offender. Classification algorithms exploiting the confidence judgments assigned to each lineup member were used to identify a confidence criterion that optimized the classification of witnesses’ responses as accurate or inaccurate. This approach produced culprit-present and culprit-absent accuracy rates that exceeded the accuracy of the traditional binary identification test decision.

A likely reaction to such radical approaches is that police and the courts would never accept a form of identification evidence that doesn’t actually involve the witness picking, or rejecting, the suspect. Our response is that any procedure that reduces the likelihood that culprits go free and innocent people are convicted warrants serious attention from a research perspective and from the perspective of giving away psychological science.

Recommended Reading

Declaration of Conflicting Interests
The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Funding
This research was supported by Australian Research Council Grants DP0556876 and DP1093210 to the first author and National Science Foundation Grant SES0850401 to the second author.

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Current Issues and Advances in Misinformation Research

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Abstract
Eyewitnesses are often called upon to report information about what they have seen. A wealth of research from the past century has demonstrated, however, that eyewitness memory is malleable and vulnerable to distorting influences, including the effects of misinformation. In this article, we review recent developments in research related to the misinformation effect, including individual differences in susceptibility, neuroimaging approaches, and protective interview procedures that may better elicit accurate event details. We conclude with a section on related false memory research.

Keywords
eyewitness, memory, law, misinformation

Twenty-five people died when a Metrolink commuter train collided with a Union Pacific freight train near Los Angeles in September of 2008 (Steinhauer, 2008). With millions of dollars in lawsuit payouts at stake, federal accident authorities began an investigation of the deadly crash and had to decide a key issue: Did the conductor pass legally through a green light, as four eyewitnesses maintained? Or did he sail through a red light, distracted by sending and receiving text messages? The conductor died in the crash, so he could not be asked. If he were at fault, the railroad company that was responsible for hiring and supervising him would be liable. If the signal malfunctioned, another company would be on the hook. After an extensive investigation, the authorities decided the eyewitnesses were wrong. The signal was red, and the engineer’s text messaging was a major contributor to the accident. Is it possible that four eyewitnesses—including a conductor, a security guard, and two railroad enthusiasts—were all mistaken about such a crucial detail? The answer is yes. Eyewitnesses make mistakes, multiple eyewitnesses can all be wrong, and their erroneous testimony can have enormous consequences.

How is it possible that so many witnesses could all be so wrong? Eyewitnesses are called upon not only to remember details of events but also to describe what people look like and to decide how confident they are in the accuracy of their memories. They are often asked to remember things they saw in extremely stressful circumstances, sometimes months or even years after the fact. They are frequently bombarded with information following the event they witnessed, such as other witnesses’ reports, investigator feedback, leading questions, and pressures to be both accurate and helpful. In the face of these challenges, eyewitnesses misremember. In a recent discussion of the distorting effect witnesses have on the memory of other witnesses, Wright, Memon, Skagerberg, and Gabriët (2009) proposed three accounts of why eyewitnesses come to report incorrect information. First, a witness’s report may be altered due to normative social influence. That is, a witness may decide that the cost of disagreeing with law enforcement—or with other witnesses—is too high, and so he adjusts his report accordingly. A second possibility is that through informational social influence processes, a witness comes to endorse a version of events that is different from what he remembers because he believes it to be truer or more accurate than his own memory. Finally, a witness’s memory can become distorted, sometimes as the result of being exposed to incorrect or misleading information. This third possibility, known as the misinformation effect, is the focus of the current review. Advances in misinformation research concerning individual differences, neurophysiological correlates, cognitive interviewing, and related research paradigms are reviewed.

What Is the Misinformation Effect?
In the wake of more than 30 years of research, an ever-growing literature continues to demonstrate the distorting effects of misleading postevent information on memory for words, faces, and...
details of witnessed events (see Loftus, 2005, for a review of the misinformation effect). In a typical misinformation experiment, research subjects are shown materials (e.g., photographs) and are then exposed to deliberately misleading information about what they saw. In a final testing phase, many subjects will inadvertently incorporate elements from the misleading information into their memory for the original source material. For example, Stark, Okado, and Loftus (2010) showed subjects a series of photographs that depicted a man stealing a woman’s wallet and hiding it in his jacket pocket. Later, subjects heard recorded narratives describing the slides. Embedded in the narratives were several pieces of misleading information (e.g., “Then the man hid the wallet in his pants pocket”). Finally, subjects were asked questions about details from the photographs, such as “Where did the thief hide the woman’s wallet?” A substantial number of those subjects not only reported that the thief hid the wallet in his pants pocket but they also reported that they remembered that information from the photographs, not the narratives.

Who Is Vulnerable?

Nobody is immune to the distorting effects of misinformation. Building on the adult literature, misinformation effects have been obtained in myriad subject samples, including infants (Rovee-Collier, Borza, Adler, & Boller, 1993), and even animals (e.g., Schwartz, Meissner, Hoffman, Evans, & Frazier, 2004). Nonetheless, there is evidence that certain types of people are especially vulnerable to misinformation effects. For instance, very young children and the elderly are more susceptible to misinformation than adolescents and adults (see Davis & Loftus, 2005). Also especially vulnerable are subjects who report lapses in memory and attention (Wright & Livingston-Raper, 2002). What do these findings tell us about the underlying mechanisms driving the misinformation effect? One argument is that a poverty of cognitive resources necessitates an increased reliance on external cues to reconstruct memories of events. As Loftus (2005) points out, misinformation effects are easier to obtain when subjects’ attentional resources are limited. Similarly, people who perceive themselves to be forgetful and who experience memory lapses may be less able (or willing) to depend on their own memories as the sole source of information as they mentally reconstruct an event.

Recently, two major studies containing more than 400 subjects have explored cognitive ability and personality factors as predictors of susceptibility to misinformation. In one study, subjects viewed slides of two crimes and later read narratives of the crimes that contained misinformation. Those subjects who had higher intelligence scores, greater perceptual abilities, greater working memory capacities, and greater performance on face recognition tasks tended to resist misinformation and produce fewer false memories (Zhu et al., 2010a). Certain personality characteristics were also shown to be associated with false memory formation, particularly in individuals with lesser cognitive ability. Specifically, individuals low in fear of negative evaluation and harm avoidance, and those high in cooperativeness, reward dependence, and self-directedness were associated with an increased vulnerability to misinformation effects (Zhu et al., 2010b). In other words, it seems that personality variables may be helpful in understanding the processes underlying memory distortion following exposure to misinformation but less so in individuals with superior cognitive ability. These interactions may help explain why individual difference results have not always replicated in false memory research.

Misinformation and Neuroimaging

Relatively new but increasingly popular tools for exploring the effects of postevent information on memory include a set of highly specialized neuroscientific methods which include functional magnetic resonance imaging, or fMRI. In a typical fMRI-based behavioral experiment, subjects undergo traditional experimental procedures in an MRI scanner, during which functional images of oxygenated blood flow in the brain are collected. The resulting images can be analyzed and interpreted as differential brain activation associated with particular tasks. Functional MRI, therefore, is a useful and noninvasive tool for examining the neurobiological correlates of behavior.

Scientists have begun to investigate brain activity associated with the misinformation effect. In a recent study (Stark et al., 2010), subjects were shown a series of photographs and later listened to an auditory narrative describing them, which included misleading information. Soon afterward, they were placed into an MRI scanner and given a test of their memory for the photographs. Functional neuroimaging data revealed similar patterns of brain activity for true and false memories, but the true memories (formed by visual information) showed somewhat more activation in the visual cortex while the false memories (derived from the auditory narrative) showed somewhat more activation in the auditory cortex. As the researchers noted, these results are congruent with the sensory reactivation hypothesis (Slotnick & Schacter, 2004, 2006), which in part proposes that the same sensory regions activated in the brain during encoding will be reactivated during retrieval. These results suggest that there may be differing brain activation patterns for true and false memories when they are encoded in different sensory modalities.

Research that involves neuroimaging and other neuroscientific measurement techniques are promising for discoveries about the effects of misinformation on memory: They can provide glimpses into how different neurological processes underlie true and false memories. At the present time, however, it would be wise to err on the side of caution in the application of these findings. Although some differences were found, the patterns of brain activation associated with true and false memories in Stark et al.’s (2010) study were not reliably distinct, and other small differences in brain activation (unrelated to the sensory reactivation hypothesis) were not fully accounted for. Furthermore, data from fMRI studies are often averaged both within and across participants, which makes interpretation at the individual level of analysis difficult. Although functional
neuroimaging is elaborate and cutting edge, it has yet to pro-
vide a sure-fire way to confidently judge whether or not a par-
ticular person’s memory is accurate.

Protecting Against Misinformation Effects

Not surprisingly, some effort has been focused on ways to pro-
tect against the distortion effect of misinformation. One tech-
nique for improving the accuracy and completeness of an eyewitness’s recollection is known as the cognitive interview, a set of rules and guidelines for interviewing eyewitnesses (see Wells, Memon, & Penrod, 2006, for a review). The CI recommends, for example, the use of free recall, contextual cues, tem-
poral ordering of events, and recalling the event from a variety of perspectives (such as from a perpetrator’s point of view). Also, the CI recommends that investigators avoid suggestive questioning, develop rapport with the witness, and discourage witnesses from guessing. In one recent study, subjects viewed an 8-minute film depicting a robbery (Memon, Zaragoza, Clifford, & Kidd, 2009). Later, subjects were given either a CI or a free-response control interview, followed by suggestive questioning about events not depicted in the film. Results indi-
cated that, consistent with earlier findings, the CI produced more correct details than did the free-response procedure. One week after the interview procedure, subjects were given a recognition test for items in the video, and subjects incorpo-
rated details from the suggestive questioning into their memory for the event. Results showed that the CI deterred the effects of suggestion, but only when it came before the suggestive inter-
view. Though the investigative process would ideally be free of all suggestive influence, a properly implemented cognitive interview may help protect the integrity of an eyewitness’s memory.

Related Lines of Research

In addition to the classic misinformation paradigm, researchers have developed other ways to demonstrate that even the subtest suggestions can produce astonishing false witness reports. For instance, a handful of studies have emerged in which subjects are simply asked if they have seen video footage of well-known news events, when in fact no such video footage exists. One study found that 40% of a British sample was will-

ing to report having seen nonexistent footage of a bus explod-
ing in the 2005 London terrorist attacks (Ost, Granhag, Udell, & Hjelmsäter, 2008). Of the subjects who claimed they saw the footage, 35% described memories of details that they could not have seen. Another study (Sjödén, Granhag, Ost, & Hjelmsäter, 2009) found that 64% of a Swedish sample claimed to have seen nonexistent video footage of an attack on the Swedish for-

eign minister, and 19% went on to describe details in the form of written narratives. The ease with which these studies elicited blatantly false memory reports is striking.

Research has also shown that suggestion can also shape autobiographical memory. Beginning with Loftus and Pickrell’s Lost in the Mall study (1995), a series of studies have successfully used personalized suggestion (or other suggestive techniques) to plant false memories of traumatic childhood events (Porter, Yuille, & Lehman, 1999), receiving a painful enema (Hart & Schooler, 2006), and even impossible events such as meeting Bugs Bunny—a Warner Brothers charac-
ter—at Disneyland (Braun, Ellis, & Loftus, 2002). These lines of research represent a broad area in their own right, with con-

troversies and applications that are beyond the scope of this paper. However, they show that misleading postevent information has implications beyond merely mistaking a green traffic light for a red one or misremembering where a pickpocket hid a woman’s wallet. If suggestion can cause us to remember experiences that never occurred, what does this say about the reliability of eyewitness evidence in general? If merely asking people if they have seen events they could not possibly have witnessed represents a strong enough suggestion to cause such staggering errors, what are the implications for witnesses who were present at a crime scene but never saw a perpetrator’s face, only to hear it described later? Researchers continue to investi-
gate what conditions lead to memory distortion, which types of people are most susceptible, and how best to prevent the distorting effects of postevent information. Unfortunately, in spite of recent scientific advances, many eyewitness errors continue to go undetected and can have devastating consequences.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Recommended Reading


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