

CHAPTER 9

Eyewitness Memory for People and Events

GARY L. WELLS AND ELIZABETH F. LOFTUS

THE MISIDENTIFICATION OF THOMAS BREWSTER	150
MEMORY FOR EVENTS	152
Misinformation Effects	153
Planting False Childhood Memories	153
Imagination and Memory	155
Other Suggestive Procedures	155

MEMORY FOR PEOPLE	155
Variables Affecting Identification Accuracy	156
The Process of Lineup Identification	157
CONCLUSIONS AND PROSPECTUS	158
REFERENCES	158

A criminal trial is, among other things, an attempt to reconstruct a past event to aid the trier of fact in determining what happened. Physical trace evidence, such as fingerprints, fibers, or blood, are often used to assist this reconstruction because, when properly collected and analyzed, trace evidence can help determine the nature of the events and the identity of the perpetrator. Eyewitness evidence can be likened to other forms of trace evidence (Wells, 1995). In effect, a criminal event involving an eyewitness leaves a trace in the brain of the eyewitness. The “memory as trace evidence” metaphor has rich implications. Like physical evidence, memory trace evidence can be contaminated, lost, destroyed, or otherwise made to produce results that can lead to an incorrect reconstruction of the event in question. Like physical trace evidence, the manner in which memory trace evidence is collected can have important consequences for the accuracy of the results.

The criminal justice system, however, has treated memory traces very differently from physical trace evidence. The collection of physical trace evidence is relatively well prescribed according to protocols that have a scientific foundation, grounded in what experts have suggested are the optimal ways to avoid contamination (Technical Working Group on Crime Scene Investigations, 1999). Police protocols for the collection, preservation, and interpretation of physical evidence are dictated largely by forensic scientists, and the practice of physical evidence collection and examination has tried to borrow as much as possible from science. Eyewitness evidence, on the other hand, is typically collected by nonspecialists who have little or no training in human memory.

Police protocols for collecting, preserving, and interpreting eyewitness evidence have not integrated the results of research conducted by memory experts. Hence, science has not been the backbone of police procedures for collecting, preserving, and interpreting eyewitness evidence. Whereas the justice system’s analysis of physical evidence, especially biological traces, has advanced rapidly in the past decade, the analysis of eyewitness evidence has languished.

We believe that this gap is due in large part to the failure of the justice system to embrace the scientific model for eyewitness evidence while accepting the scientific model for physical evidence. Perhaps it is no surprise, therefore, that mistaken eyewitnesses account for more convictions of innocent persons than all other causes combined and that it has been scientific analysis of biological evidence (forensic DNA) that has proven that these eyewitnesses were in error (Scheck, Neufeld, & Dwyer, 2000; Wells, Small, Penrod, Malpass, Fulero, & Brimacombe, 1998).

The idea of using a scientific model to collect, analyze, and interpret eyewitness evidence is readily apparent in the case of both memory for events and memory for people. Consider, for example, how social scientists collect data from people. In surveys about past events, great care is taken in constructing questions because of clear evidence that people’s reports are influenced by how the questions are worded (Loftus, Fienberg, & Tanur, 1985; Loftus, Smith, Klinger, & Fiedler, 1992). Scientific approaches to minimizing and detecting response biases and demand characteristics in surveys represent solid models for how law enforcement might go about the process of questioning eyewitnesses. In the case of

eyewitness identification, the “lineup as experiment” analogy is a rich scientific model that law enforcement could follow (see Wells & Luus, 1990). According to this analogy, police conducting a lineup are like experimenters conducting research. Police have a hypothesis (that the suspect is the culprit); they create a design to test the hypothesis (embed the suspect among fillers); they provide instructions (e.g., “Don’t guess. The culprit might or might not be in the lineup.”); they collect responses (e.g., selection, certainty); and they interpret the results. The same factors that can make the results of a scientific experiment uninterpretable can make the results of a lineup uninterpretable (e.g., confoundings, biased instructions, experimenter expectancy effects, selective recording of results).

The failure of the criminal justice system to adopt a scientific model for memory trace evidence while embracing such a model for physical trace evidence is perhaps attributable to several related factors. We note, for instance, that eyewitness evidence was a staple in criminal investigations long before any scientific studies of eyewitnesses were conducted. The most scientific analyses of physical evidence (such as forensic DNA), on the other hand, were developed by scientists first and adopted by crime investigators later. Had the lineup been invented by scientists before it was ever used by the criminal justice system, law enforcement would be following a scientific protocol. This protocol would involve mock witness pretesting of fillers, double-blind testing procedures, carefully worded instructions, convergent measures, videotaping, careful documentation of records, and an interpretational framework for the identification responses.

The failure of the criminal justice system to adopt a scientific model for eyewitness evidence may also be attributable to the criminal justice system not having a focused theory of memory. In fact, the justice system as a whole might have no theory at all and its members may be operating under several theories. Implicitly, however, it appears that the justice system is assuming that stored information remains largely unchanged as a function of postevent information and is relatively impervious to suggestion, and that memory failures are primarily failures to retrieve information. In fact, however, memory reports are readily influenced by postevent information, are very susceptible to suggestion, and can err in numerous ways, including memory reports of entire events that were never witnessed (Loftus, 1996).

In this chapter, we review major developments in the scientific literature on eyewitness evidence. There are two main sections to this review. First, we review research and theory on eyewitness memory for events. The primary lesson of the memory for events research is that memory for events is malleable. The process of recollection is reconstructive, and sources of information that are used to reconstruct are not

only from the event itself but also from postevent information gleaned in various ways after the event has occurred. In some cases, mere imagination can have the power to make people believe that they witnessed or experienced an event that did not happen. The second main section reviews work on eyewitness memory for people, especially the ability of eyewitnesses to identify culprits from lineups. The primary lesson of the eyewitness identification work is that mistaken identification rates can be very high under certain conditions and many of these conditions could actually be avoided by the use of more scientific procedures for lineups.

Before we begin our review, we describe a case that we believe illustrates many of the points that are central to this chapter.

THE MISIDENTIFICATION OF THOMAS BREWSTER

It was December 14, 1984. Terry Arendt and Sherrie Gillaspey were parked in a remote area of Shasta County, California. Terry and Sherrie were friends, not lovers, and were enjoying each other’s company when a car drove by three times. After the third time, a bullet went through the driver’s side window, killing Terry. A male approached the car and forced Gillaspey a short distance from the car, where he sexually assaulted her. The killer then left. A few days later, Gillaspey worked with a sketch artist to develop a likeness of the killer. Thomas E. Brewster, a lifelong resident of the area, bore a resemblance to the sketch and thereby became a suspect in the killing.

On December 19, 1984, Gillaspey was shown a photo lineup with Brewster’s photo in it. She could not make a positive identification. One day later, Gillaspey was shown a live lineup in which Brewster appeared. Again, Gillaspey could not make a positive identification. Brewster was not arrested. Nearly four years later, in August 1988, detectives again showed Gillaspey a photo lineup with Brewster’s picture in it. Once again she could not make a positive identification.

In 1995, 11 years after the murder, two new detectives were assigned to the case. These detectives brought photos and, after interviewing her with the photos, she signed a statement saying that Brewster was the killer. Six days later, she identified Brewster from a live lineup. The prosecutor decided to seek the death penalty and the trial did not commence until 1997 (*California v. Brewster*, 1997). Motions to suppress the identification were denied. After the trial had begun, a criminalist found a semen stain on the blouse that Gillaspey wore that evening and the stain was tested for DNA. The trial was in progress and Gillaspey was still on the

stand after having positively identified Brewster in court when the DNA test results came in. Brewster was not the killer. Gillaspey was carefully debriefed and all charges against Brewster were dismissed.

At least 80 people have been released from prison in recent years after DNA proved that they had been mistakenly identified by eyewitnesses (Scheck et al., 2000; Wells et al., 1998). In many cases, there were multiple witnesses who misidentified the person, many were sentenced to death, and they served an average of about eight years before being freed based on the DNA tests. Although DNA tests eventually saved these individuals from the mistaken eyewitness identification problem, DNA can be used to exonerate only a small fraction of people from mistaken identification. Forensic DNA tests cannot prevent wrongful convictions in most eyewitness cases because the biological traces needed for DNA tests are not left behind by perpetrators in the vast majority of crimes. Most murders and nearly all robberies, drive-by shootings, burglaries, hit-and-run offenses, and other common crimes leave no biological trace evidence that can be clearly linked to the perpetrator or that can be used to exonerate an innocent person. It is no coincidence that nearly all of the DNA exoneration cases are cases involving sexual assault. Sexual assaults commonly have biological evidence (semen) that is unambiguously linked to the perpetrator, whereas most other cases do not.

The Brewster case is somewhat unique in one respect; the new detectives who took over the case (13 years after the murder) taperecorded their interview with Gillaspey. We think it is important to print excerpts from that interview because they illustrate some of the dynamics of the eyewitness problem. Keep in mind that the victim-witness, Gillaspey, had already viewed either photos or live lineups containing Brewster at least four times before the new detectives interviewed her in 1995. She had never made a positive identification of Brewster despite these numerous attempts prior to the 1995 interview.

The interview itself is quite long, so we reprint only a small portion here. A full transcript of the taped interview was entered into evidence at a hearing on a motion to suppress the identification and can be obtained from the first author on request. Most of the interview involves Gillaspey recalling the events of the night of the murder. At some point, however, the detectives decided to show her a photospread that included yet another photo of Brewster. In the following transcript quotes from the tape, D1 is the first detective, D2 the second detective, and SG is the witness, Sherrie Gillaspey:

SG: Who is this guy? (apparently pointing to the photo of Brewster).

D1: Why do you ask me that?

SG: I don't know, he looks familiar but (unintelligible).

D1: Have you seen him before?

The conversation turned to a discussion of whether she could recognize the voice of the perpetrator. The detectives then turned the conversation back to the photos.

D1: And what photograph are you talking about?

SG: Number three.

D1: And that individual looks familiar to you, you don't know in what respect?

SG: Nobody else here does, all I know is he does for some reason.

D1: Well, let's go through a process of elimination. Is he somebody that you went to school with?

SG: Huh uh.

D1: Is he somebody who works in a store where you shop?

SG: No.

D1: Is he somebody you bought a car from?

SG: No.

D1: Is he an old schoolteacher?

SG: Nope.

D1: Is he an old boyfriend?

SG: No.

D1: He work in a service station?

SG: No, no.

D1: Is he somebody that has hit on you?

It is important to note that these detectives were fully aware that Sherrie Gillaspey had been shown photos of Brewster and had viewed him in a live lineup at various times over the prior 13 years. Not once, however, did they ever ask if he looked familiar because he was the same person that other detectives had shown her previously. The interview continued:

D1: Could he be the guy that assaulted Terry and you that night?

SG: It's possible. I mean, I would really like to hear, I would really like to hear him talk.

D1: Well, I can arrange that.

Gillaspey had already heard his voice in the 1985 lineup. Again, however, the detectives offered no information to her about that fact. Instead, the discussion turned to signing a

statement. She was asked to indicate number three on the statement form and to write in the comments section.

SG: So, what do you want me to put, just write . . .

BM: Well, let's think about that for a minute. . . . One of the things that I, that I probably rely on more than anything else is body language . . . and emotional reaction. I think it's safe to say that you went to number three just like that.

SG: Uh huh, totally, yeah.

D1: And my next question is you became flushed. Why did you do that?

SG: I don't know, well immediately, immediately in my mind, you know, in my mind thinks, is that the person, you know, kind of . . .

D1: That's the answer I'm looking for. Could that be the guy that did all this?

SG: Yeah.

Notice how the detective tells Gillaspay what her emotional reaction was and interprets her body language. Then, when she says something that agrees with the detective's suspicions about the guilt of Brewster, he tells her that was the answer he was looking for. The interview continues.

D1: Then what, see what, what I have to worry about now is if in fact you do come back over and we conduct a physical lineup and you identify this individual as absolutely unequivocally, without a doubt the guy that was there . . .

SG: Uh huh.

D1: Then obviously the next thing that happens is somewhere down the line we have to think about what happens in court. And we don't want to taint that with some, with a comment that you might inadvertently make on the back of that card.

The taped interview then ended. Six days later, Gillaspay picked Brewster from a live lineup and was absolutely positive of her identification.

The Brewster case illustrates much of what concerns scientific psychologists about eyewitness testimony. First, it illustrates what seems to be a general misunderstanding about the nature of human memory, namely, that memory might get better (or at least not deteriorate) with time. Gillaspay had already viewed a photo of Brewster a mere five days after the incident and viewed him again in a live lineup that included Brewster a mere six days after the incident. In neither case could she identify Brewster. And yet, police, the

prosecutor, and the judge were willing to accept her identification of Brewster over 3,850 days later.

Second, this case illustrates the detective's lack of understanding of the processes and the power of suggestive procedures in shaping an eyewitness's recollections. Presenting Brewster, both in photos and live, to the eyewitness several times over an 11-year period is not the only suggestive aspect of the case. The key interview in 1995, as noted in the transcript, included the detective interpreting the eyewitness's behavior for her ("you went to number three just like that . . . you became flushed"). It included a suggestive prediction regarding how she might behave in the subsequent live lineup ("we conduct a physical lineup and you identify this individual as absolutely unequivocally, without a doubt the guy that was there"), and suggestions that she not say anything in her photo-identification card that would not play well later in court.

Third, this case illustrates a problem of source monitoring. Gillaspay seemed to be unaware that Brewster's familiarity was the result of her being exposed to him after the murder rather than his being the person she saw on the night of the murder. Fourth, this case illustrates how the certainty of an eyewitness is not only a poor indicator of whether the witness is accurate (Gillaspay was positive at trial even though she had mistakenly identified the defendant), but also how certainty is a product of variables other than the memory of the eyewitness.

Finally, this case illustrates how the justice system fails to take advantage of what is known about human memory and social influence to develop appropriate safeguards against mistaken identification. There was a detailed and reasonable motion to suppress the eyewitness identification evidence. The suppression motion was denied in the Brewster case, as it is rather routinely in nearly all cases, even though the identification procedures were highly suggestive (Loftus & Doyle, 1997/2000). As previously stated, we believe that some members of the justice system seem to operate under a theory of memory that does not give much credence to the idea that postevent information can account for serious mistakes by eyewitnesses.

MEMORY FOR EVENTS

As the Brewster case suggests, postevent viewings of a suspect's likeness, either by photograph or in person, can help to make someone look familiar later. That enhanced familiarity can lead to a false identification of the suspect as the person who committed the crime. But decades of research has shown that postevent information, particularly when it is misleading,

can also alter recollections of other details about key events. A typical finding is that after receiving new information that is misleading in some way, people make errors when they report what they saw. The new, postevent information is often incorporated into the recollection, supplementing or altering it, sometimes in dramatic ways.

Misinformation Effects

Current research showing how memory can become skewed when people assimilate new data uses a three-part procedure. Experimental witnesses first see a complex event, such as a simulated violent crime or an automobile accident. Subsequently, half of the witnesses receive new misleading information about the event. The other half do not get any misinformation. Finally, all witnesses attempt to recall the original event. In a typical example of a study using this paradigm, witnesses 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, those given the phony information tended to adopt it as their memory; they said they saw a yield sign (see Loftus, Coan, & Pickerell, 1979/1996, for a review of this study and similar research). In these and many other experiments, people who had not received the misleading information provided 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% (Belli, 1993; McCloskey & Zaragoza, 1985).

This degree of distorted reporting has been found in scores of studies, involving a wide variety of procedures. People have recalled nonexistent broken glass and tape recorders, a clean-shaven man as having a mustache, straight hair as curly, stop signs as yield signs, hammers as screwdrivers, and even something as large and conspicuous as a barn in a bucolic scene that contained no buildings at all. In short, misleading postevent information can alter a person's recollection in a powerful, and often predictable, manner. The change in report arising after receipt of misinformation is often referred to as the "misinformation effect" (Loftus & Hoffman, 1989).

Planting False Childhood Memories

During the last decade of the twentieth century, eyewitness researchers took things a step further; they turned their attention to the question: Just how far can we go with people in terms of distorting their memories with suggestion and misinformation? Rather than merely adding a detail to a

previously acquired memory or tinkering with a detail here and there, they studied whether suggestive procedures can create entirely false memories for the past. Researchers devised procedures that could make people believe and remember that earlier in life they had been hospitalized when they had not (Hyman, Husband, & Billings, 1995), that they had been lost and frightened in a mall when they had not (Loftus et al., 1996), that they had been victims of vicious animal attacks as children even though they had not been (Porter, 1998; Porter, Yuille, & Lehman, 1999), and even that they had witnessed demonic possession when they were very young (Giuliana, Mazzoni, Loftus, & Kirsch, 2001). This line of false memory research shows that it is indeed possible to create quite complex, elaborate, and "confident" false memories in the minds of research participants.

To see how false memories of events can be created, we describe one method in some detail: planting a childhood memory for something that never happened. One goal of the research was to find a method for planting a memory that, if the event had actually occurred, would have been at least mildly traumatic. But the experience should not, of course, be so upsetting to the person that it would be unethical to create a false memory about it.

Loftus and colleagues settled on the idea of trying to plant a very specific memory of being a 5-year-old lost in a shopping mall, being frightened, crying, and ultimately rescued by an elderly person and reunited with the rest of the family (see Loftus & Ketcham, 1994, for a description of the origin of the idea, and Loftus et al., 1996, for more details on this research). Here is how it was done: The participants, all adults, were asked to try to remember childhood events that were supplied by their mother, father, older sibling, or other close relative. Three of the events were true, and one was the research-crafted false event about getting lost in a shopping mall, department store, or other public place. In phase 1, participants completed a booklet containing four one-paragraph stories about events from their childhood provided by their relative. Three events actually happened, and the fourth, always in the third position, was false.

The false event was constructed from information provided by a relative of the participant who gave the researchers details about a plausible shopping trip. The relative told the researchers (a) where the family would have shopped when the participant was about five years old; (b) which members of the family usually went along on shopping trips; (c) what kinds of stores might have attracted the participant's interest; and (d) verification that the participant had not been lost in a mall around the age of 5. This information was then used to craft the false event. The false events always included the following elements about the

participant: (a) lost for an extended period of time; (b) crying; (c) lost in a mall or large department store at about the age of 5; (d) found and aided by an elderly woman; and (e) reunited with the family.

Participants read what their relative had told us about each event, and then completed the booklets by writing what they remembered about each event. If they did not remember the event, they were told to write "I do not remember this." When the booklets were returned, participants were called and two interviews were scheduled. These occurred approximately one to two weeks apart. Participants were told that the researchers were interested in examining how much detail they could remember and how their memories compared with those of their relative. The event paragraphs were not read to them verbatim, but rather bits of information were provided as retrieval cues. When participants had recalled as much as possible, they were asked to rate the clarity of their memory for the event on a scale of 1 to 10, with 1 being not clear at all and 10 being extremely clear.

In all, participants remembered something about 68% of the true events that they were asked about. This figure did not change from the initial report through the two follow-up interviews. The rate of "remembering" the false event was lower, at about 25%. Statistically, there were some differences between the true memories and the false ones: More words were used to describe the true memories, and the true memories were rated as being somewhat more clear. But with many of the participants, if an onlooker were to watch the participant describe an experience, it would be difficult indeed to tell whether the report was of a true or a false memory.

Other investigators used a similar procedure to plant false memories of even more unusual events. In one study, college students were asked to recall actual events that had been reported by their parents and one experimenter-crafted false event (Hyman et al., 1995). The false event was an overnight hospitalization for a high fever with a possible ear infection, or a nonexistent birthday party with pizza and a clown. Parents confirmed that neither of these events had happened, yet participants were told that they had experienced one of the false events at about the age of 5.

Participants tried to recall childhood experiences that they thought had been supplied by their parents, in the belief that the experimenters were interested in how people remember shared experiences differently. All events, both the true ones and the false one, were first cued with an event title (family vacation, overnight hospitalization) and an age. Hyman et al. (1995) found that participants remembered approximately 80% of the true events. As for the false event, by the end of the second interview, 20% of the participants had remem-

bered all or part of this creation. In a separate study, Hyman and collaborators created even more unlikely false memories, such as attending a wedding reception and accidentally spilling a punch bowl on the parents of the bride or having to evacuate a grocery store when the overhead sprinkler systems erroneously activated. This time, approximately 25% accepted all or part of the false memory by the end of the third interview (see Hyman & Billings, 1998; Hyman & Pentland, 1996).

A recent doctoral dissertation project also succeeded in planting false memories via suggestion that ostensibly came from relatives of the participants. This research planted memories not only for getting lost and having undergone serious medical procedures, but also for serious animal attacks, serious indoor accidents, and serious outdoor accidents, events that would have been traumatic had they actually occurred (Porter, 1998; Porter et al., 1999). These investigators reported that just over 25% of their participants created a rather complete false memory, and another 30% created a partial memory. Clearly, these methods are capable of inducing false memories in a sizable percentage of people.

Like Hyman and Billings (1998), Porter et al. (1999) found that the participants who were most susceptible to memory implantation were those who scored high on the Dissociative Experiences Scale, a self-report measure of the extent to which participants experience lapses in memory and perception in their everyday life. As Loftus and colleagues had found (e.g., Loftus et al., 1996), these investigators also found that participants gave higher ratings of vividness or clarity when relating a real memory as opposed to an implanted one. Interestingly, the real memories related by the participants did not contain more details than the planted memories.

In remarking about their findings, Porter and colleagues (1999) were particularly impressed that fully 20% of created memories were given with the highest possible confidence rating. At the end of their study, over 33% of the participants who had created a false memory were willing to wager money that the false event occurred. Moreover, the investigators reported that at the time the participants were debriefed, most of them appeared to be "genuinely astonished" when told about the parental reports and the fact that their memories were false. Many appeared amused and wanted to talk more with the researchers about the process of memory creation, in some instances, even requesting literature in the area of research. These features of the reaction help convince the researchers that the participants had in fact recalled the false event, as opposed to responding to demand characteristics of the study. It seems evident from these findings that participants are actually "remembering" these false

experiences, in the sense that they have a genuine recollective feeling about the experiences.

Imagination and Memory

It should be kept in mind that these studies used a rather strong form of suggestion in which a source with some prestige suggested that an event had occurred in the past. However, such heavy-handed methods are not needed to get people to increase their confidence that they had experiences in the past that they probably did not experience. Inducing people to imagine that they have had an experience can influence people to recall having had such an experience.

To explore what happens to memory when people imagine events that did not occur, Garry, Manning, Loftus, and Sherman (1996) used a three-stage procedure. Participants were first asked about 40 possible events from their childhood and indicated the likelihood that these events happened to them on a scale of responses ranging from definitely did not happen to definitely did happen. Two weeks later, the participants were asked to imagine that they had experienced some of these events. The events included falling and breaking a window with their hand, getting in trouble for calling 911, finding a \$10 bill in a parking lot, or being pulled out of the water by a lifeguard. Different participants were asked to imagine different events.

Consider a typical one-minute imagination exercise, one in which participants imagined breaking a window with their hand. They were told to picture that it was after school and they were playing in the house when they heard a strange noise outside. They were told to imagine themselves running toward the window, tripping, falling, reaching out, and breaking a window with their hand. While imagining the scene, the participants were asked several questions, such as "What did you trip on?" and "How did you feel?" After imagining several situations, the participants again, sometime later, were given the list of 40 childhood events to respond to.

Comparing the responses to the two questionnaires about possible childhood experiences, it was found that a one-minute act of imagination led a significant minority of participants to indicate that an event was more likely to have happened after previously identifying it as unlikely to have occurred. In the broken window scenario, 24% of the participants who imagined the event showed an increase in confidence that the event had actually occurred. For those participants who did not imagine breaking the window, 12% showed a corresponding increase. In the "got in trouble for calling 911" scenario, 20% of the participants who imagined the event showed an increase in confidence that the event had occurred when they were children. For those participants who

did not imagine getting in trouble for calling 911, only 11% showed a corresponding increase.

Numerous other investigators have used imagination to alter people's beliefs about their past. Imagination can make people believe that they have had experiences in the distant past (Heaps & Nash, 1999; Paddock, Joseph, Chan, Terranova, Maning, & Loftus, 1998), but it also can make people believe that they have had experiences in the recent past (Goff & Roediger, 1998; Thomas & Loftus, 2001).

Other Suggestive Procedures

The power of suggestion to create false beliefs and false memories has now been shown repeatedly. Suggestive dream interpretation has led people to believe that they were lost for an extended period of time, or that they faced a great danger from which they were rescued (Mazzoni & Loftus, 1998). Reading suggestive stories and getting false feedback about one's fears has led people to believe that they witnessed demonic possession in the past or that they nearly swallowed an object and choked (Mazzoni et al., 2001). Suggestive false feedback about one's visual-motor skills has led people to believe that they could remember experiences from the day after birth (DuBreuil, Garry, & Loftus, 1998; Spanos, Burgess, Burgess, Samuels, & Blois, 1999). These findings should give pause to investigators and others who think that they are extracting recalcitrant, accurate memories from witnesses and suspects by using techniques that resemble the ones that psychologists have studied. The danger lies in planting the seed of suggestion that then takes root and grows into a mighty false memory that has the power to convict an innocent person.

MEMORY FOR PEOPLE

An eyewitness's identification of a particular person as the one who committed a crime is a powerful form of evidence. An eyewitness who says "That's the man I saw pull the trigger" is providing direct evidence of guilt. Even fingerprints are not direct evidence of guilt because they indicate only that a given person touched a given surface, and there might have been many innocent ways to have touched the surface. Hence, although most evidence in courts of law is circumstantial, eyewitness identification evidence is *direct* evidence of guilt.

Eyewitness researchers' concern about the accuracy of eyewitness identification evidence is grounded in two broad observations. First, eyewitness experiments involving staged crimes show that rates of mistaken identification can be very

high under certain conditions (Wells, 1993). These conditions are often represented in real-life cases. Second, real-world cases in which people have been convicted of crimes that they did not commit show that mistaken identification was the primary evidence leading to their conviction (Huff, Rattner, & Sagarin, 1986; Scheck et al., 2000; Wells et al., 1998).

Variables Affecting Identification Accuracy

How do mistaken identifications happen? Like most important phenomena, the causes are many. The scientific approach to studying the causes of mistaken identification has generally been to isolate suspected variables in controlled experiments. The list of variables that have been shown to affect rates of mistaken identification is rather large. One common approach to organizing the findings has been to categorize the variables into witness characteristics (e.g., sex, intelligence), characteristics of the witnessed event (e.g., exposure duration, presence of a weapon), postevent variables (e.g., suggestions from other witnesses, exposure to a sketch), characteristics of the identification task (e.g., structure of the lineup, instructions to witnesses prior to viewing the lineup), and postidentification events (e.g., feedback to the eyewitness regarding the identification). We refer to this as the chronological approach because the categories are ordered in the temporal sequence in which they unfold. Another way to organize these variables is according to whether they are controllable by the criminal justice system in actual cases (e.g., the structure of a lineup) or are not controllable in real cases (e.g., exposure duration), which is known as the system-variable versus estimator-variable distinction (Wells, 1978).

More recently, Wells and Olson (2001) suggested yet another distinction among eyewitness identification variables: between suspect-bias variables and general impairment variables. A suspect-bias variable is one that can account for why an eyewitness, when presented with a lineup, specifically selected the innocent suspect rather than one of the fillers in the lineup (or simply saying "I don't know" or "None of these people"). A general impairment variable, on the other hand, cannot account for which person the suspect picked, but can account only for poor eyewitness performance more generally. Consider, for instance, the other-race effect: There is now rather good evidence that people have more difficulty identifying persons of another race than their own race (see meta-analysis by Meisner & Brigham, 2001). The other-race effect is a general impairment variable in the sense that it cannot account for why the witness would select the suspect in the lineup rather than one of the fillers in the lineup. (This example assumes, of course, that all members of the lineup are of the same race, a race different from that of the eyewitness.)

On the other hand, consider the problem of structurally biased lineups. In a structurally biased lineup, the suspect fits the description that the eyewitness had given of the culprit, whereas the fillers (known innocents, distractors, or foils) do not fit that description. Structural lineup bias is a suspect-bias variable rather than a general impairment variable because it can account for why the eyewitness selected the suspect rather than selecting some other lineup member.

Table 9.1 lists a large number of variables known to affect the accuracy of eyewitness identification. The list is not exhaustive, but it represents the variables that have been studied most often. Each variable is then categorized according to each of the three types of categorization. The last column of Table 9.1 lists one representative publication dealing with each variable. We recommend a meta-analysis by Shapiro and Penrod (1986), which included most of these variables, for information on estimates of effect size, a standardized statistical estimate of the impact that one variable has on another variable. Effect sizes are often used to compare the relative impact of one variable versus some other variable. We caution readers, however, against inferring too much from effect size estimates. Effect sizes are very sensitive to the particular operationalizations that are used in manipulating each of the variables.

It is apparent from Table 9.1 that chronological categorization and system versus estimator categorization are related. This is because system variables do not normally come into play until after the crime event has occurred. The general impairment versus suspect-bias variables distinction, on the other hand, is not restricted to any particular chronological frame. In addition, the general impairment and suspect-bias variables can be either system or estimator variables. Finally, note that a few variables are not restricted to a single category. One variable is the period of time between the event and the person's recollection, sometimes referred to as retention interval. Retention interval is commonly construed as an estimator variable. However, there are times when the justice system has some control over the retention interval, such as when investigators show eyewitnesses a lineup that could have been conducted at an earlier point in time. Also, exposure to mugshots might normally be considered a general impairment variable because it generally interferes with the witness's ability to keep the perpetrator's face in mind later, when viewing the lineup. At other times, however, exposure to mugshots could be a specific-suspect-bias variable if it makes an innocent suspect seem familiar because he or she was seen in the set of mugshots.

Each of the three ways of categorizing eyewitness identification variables has a different utility. The chronological categorization assists in developing a temporal understanding

TABLE 9.1 Eyewitness Identification Variables and Their Categories

Variable	Chronological Category	System versus Estimator Category	General Impairment versus Suspect-Bias Category	Example Citation
Sex of witness	WC	E	GI	
Intelligence of witness	WC	E	GI	Brown, Deffenbacher, & Sturgill, 1977
Age of witness	WC	E	GI	Chance & Goldstein, 1984
Face recognition skills	WC	E	GI	Woodhead, Baddeley, & Simmonds, 1979
Personality	WC	E	GI	Hosch & Platz, 1984
Alcohol	WC	E	GI	Yuille & Tollestrup, 1990
Prior exposure/source confusion/bystander	WC	E	SB	Read, 1994
View	EC	E	GI	Lindsay, Wells, & Rumpel, 1987
Disguise of perpetrator	EC	E	GI/SB	Cutler, Penrod, & Martens, 1981
Exposure time	EC	E	GI	Ellis, Davies, & Shepherd, 1977
Same versus other-race identification	EC	E	GI	Anthony, Cooper, & Mullen, 1992
Stress	EC	E	GI	Christianson, 1992
Weapon	EC	E	GI	Stebly, 1992
Retention interval	PE	E/S	GI	Krafka & Penrod, 1985
Interpolated mugshots	PE	S	GI/SB	Brigham & Cairns, 1988
Overheard descriptions	PE	S	SB	Loftus & Greene, 1980
Prelineup instructions	ID	S	GI	Stebly, 1997
Structure of lineup/fillers	ID	S	SB	Wells, Rydell, & Seelau, 1993
Simultaneous/sequential procedure	ID	S	GI	Lindsay & Wells, 1985
Suggestive behaviors during lineup	ID	S	SB	Phillips, McAuliff, Kovera, & Cutler, 1999
Postidentification feedback	PI	S	SB	Wells & Bradfield, 1998

Note: WC = witness characteristics, EC = event characteristics, PE = postevent factors, ID = identification test variables, PI = postidentification variables, S = system variable, E = estimator variable, GI = general impairment variable, SB = suspect-bias variable.

of the order in which these variables come into play in the witnessing experience. The system versus estimator categorization is useful for developing methods for increasing the accuracy of eyewitness identification evidence via system-variable recommendations to the justice system. The general impairment versus suspect-bias categorization is relevant to understanding how jurors might reason about eyewitness identification in a given case.

The relevance of the general impairment versus suspect-bias distinction to jurors' judgments of eyewitness identification evidence requires more explanation. Consider a case in which it is argued to the jury that the eyewitness had a very poor view of the perpetrator, was of a different race than the perpetrator, and did not view a lineup until two months after the crime. Wells and Olson (2001) argue that these variables might not matter much to the jury when they deliberate because they fail to explain why the eyewitness picked the suspect out of the lineup and did not pick a filler. If the other-race effect made the lineup members "all look alike," then how was the witness able to pick out the suspect? The problem with general impairment variables is that they tend to beg the question for the jury as to why the eyewitness picked the suspect instead of one of the fillers. Suspect-bias variables, on the other hand, tend to answer that question. A structurally

biased lineup, for instance, serves to explain why the eyewitness preferred the suspect rather than one of the fillers. Hence, the general impairment versus suspect-bias variable distinction may be very useful in terms of understanding why some variables might be more important to juries than others in terms of their willingness to accept identification testimony.

The Process of Lineup Identification

One of the simplest and most useful ideas in understanding mistaken identifications from lineups is the *relative judgment conceptualization*. According to this conceptualization, eyewitnesses tend to identify the person from a lineup who most closely resembles the eyewitness's memory of the perpetrator *relative* to the other members of the lineup (Wells, 1984). This process of identification works reasonably well as long as the actual perpetrator is in the lineup. When the perpetrator is not in the lineup, however, there is still someone who looks more like the perpetrator than do the other lineup members, and eyewitnesses have a propensity to identify that person.

There are several reliable phenomena that support the relative judgment conceptualization. For example, failure to give explicit instructions to the eyewitness that emphasize

that the perpetrator might *not* be in the lineup leads eyewitnesses to pick someone from the lineup at very high rates regardless of whether the perpetrator is present (Malpass & Devine, 1981). Even with these instructions, eyewitnesses tend to use relative judgments. For example, removing the perpetrator from a lineup without replacement leads most eyewitnesses who otherwise would have selected the perpetrator to instead select the “next best” person in the lineup rather than indicate that the perpetrator is not there (Wells, 1993). In addition, eyewitnesses who report that they used a relative comparison process (e.g., “I compared number three to number two”) or an elimination process (e.g., “I knew it wasn’t number one”) are more likely to have made a mistaken identification than are those who report that the face “just popped out” (Dunning & Stern, 1994). This makes sense to the extent that the relative judgment process is an effortful, deliberate elimination strategy whereas absolute judgments are automatic, rapid, true recognition responses.

Perhaps the best evidence that relative judgments are involved in mistaken identification comes from research on simultaneous versus sequential presentation procedures for identifications. Simultaneous lineups are ones in which all members of the lineup are shown to the eyewitness at one time, whereas a sequential procedure involves showing the eyewitness one lineup member at a time and forcing the eyewitness to make a recognition decision (yes or no) before viewing the next lineup member. The sequential procedure prevents relative judgments because, even though the eyewitness can compare the lineup member being viewed to those who have already been shown, the eyewitness cannot be sure what the next lineup member looks like. As a result, the sequential procedure forces eyewitnesses to use a more “absolute” criterion for making an identification. Compared to the simultaneous procedure, the sequential procedure produces fewer mistaken identifications in lineups that do not contain the actual perpetrator, but it does not significantly impair eyewitnesses’ abilities to identify the perpetrator in perpetrator-present lineups (Cutler & Penrod, 1988; Lindsay, Lea, & Fulford, 1991; Lindsay & Wells, 1985).

CONCLUSIONS AND PROSPECTUS

We began this chapter with a metaphor in which human memory is likened to trace evidence. Although the legal system shows considerable concern and exercises caution to avoid contaminating physical traces at a crime scene (e.g., blood, fibers), similar cautions tend not to be exercised in avoiding the contamination of human memory in eyewitnesses. We have described research showing how suggestive questioning

and suggestive lineup procedures can have immense effects on the testimony of eyewitnesses. Memories for events that never occurred are readily confused with memories for actual events, and mistaken eyewitness identifications are readily confused with accurate eyewitness identifications. Although there has been some recent success in getting the criminal justice system to make use of psychological science in its procedures for collecting eyewitness evidence (see Wells, Malpass, et al., 2000), there remains a large gap between what psychological science advises for collecting eyewitness evidence and actual practices of criminal investigators.

Future research needs to address this gap between psychological science and the practices of the legal system with regard to eyewitness memory. To some extent, this might be facilitated by research directed at the question of what theories the criminal justice system is using in collecting eyewitness evidence. Undoubtedly, these theories are more implicit than explicit, so it is unlikely that one can simply ask criminal justice actors to articulate their theories about memory. However, we believe that an understanding of these implicit theories can tell us something about how to better communicate our findings to those in the criminal justice system with a somewhat better chance to actually affect how the justice system thinks about and manages the collection of eyewitness evidence.

REFERENCES

- Anthony, T., Cooper, C., & Mullen, B. (1992). Cross-racial facial identification: A social-cognitive integration. *Personality and Social Psychology Bulletin, 18*, 296–301.
- Belli, R. F. (1993). Failure of interpolated tests in inducing memory impairment with final modified tests: Evidence unfavorable to the blocking hypothesis. *American Journal of Psychology, 106*, 407–427.
- Brigham, J. C., & Cairns, D. L. (1988). The effect of mugshot inspections on eyewitness identification accuracy. *Journal of Applied Social Psychology, 18*, 1394–1410.
- Brown, E., Deffenbacher, K., & Sturgill, W. (1977). Memory for faces and the circumstances of the encounter. *Journal of Applied Psychology, 62*, 311–318.
- California v. Brewster, 95 F 8703 (1997).
- Chance, J. E., & Goldstein, A. G. (1984). Face recognition memory: Implications for children’s eyewitness testimony. *Journal of Social Issues, 40*, 69–85.
- Christianson, S. A. (1992). Emotional stress and eyewitness memory: A critical review. *Psychological Bulletin, 112*, 284–309.
- Cutler, B. L., & Penrod, S. D. (1988). Improving the reliability of eyewitness identification: Lineup construction and presentation. *Journal of Applied Psychology, 73*, 281–290.

- Cutler, B. L., Penrod, S. D., & Martens, T. K. (1987). The reliability of eyewitness identification: The role of system and estimator variables. *Law and Human Behavior, 11*, 233–258.
- DuBreuil, S. C., Garry, M., & Loftus, E. F. (1998). Tales from the crib: Age regression and the creation of unlikely memories. In S. J. Lynn & K. M. McConkey (Eds.), *Truth in memory* (pp. 137–160). New York: Guilford Press.
- Dunning, D., & Stern, L. B. (1994). Distinguishing accurate from inaccurate identifications via inquiries about decision processes. *Journal of Personality and Social Psychology, 67*, 818–835.
- Ellis, H. D., Davies, G. M., & Shepherd, J. W. (1977). Experimental studies of face identification. *Journal of Criminal Defense, 3*, 219–234.
- Garry, M., Manning, C., Loftus, E. F., & Sherman, S. J. (1996). Imagination inflation: Imagining a childhood event inflates confidence that it occurred. *Psychonomic Bulletin and Review, 3*, 208–214.
- Giuliana, A. L., Mazzoni, G. A. L., Loftus, E. F., & Kirsch, I. (2001). Changing beliefs about implausible autobiographical events: A little plausibility goes a long way. *Journal of Experimental Psychology: Applied, 7*, 51–59.
- Goff, L. M., & Roediger, H. L. (1998). Imagination inflation for action events. *Memory and Cognition, 26*, 20–33.
- Heaps, C., & Nash, M. (1999). Individual differences in imagination inflation. *Psychonomic Bulletin and Review, 6*, 313–318.
- Hosch, H. M., & Platz, S. J. (1984). Self-monitoring and eyewitness accuracy. *Personality and Social Psychology Bulletin, 10*, 283–289.
- Huff, R., Rattner, A., & Sagarin, E. (1986). Guilty until proven innocent. *Crime and Delinquency, 32*, 518–544.
- Hyman, I. E., & Billings, F. J. (1998). Individual differences and the creation of false childhood memories. *Memory, 6*, 1–20.
- Hyman, I. E., Husband, T. H., & Billings, F. J. (1995). False memories of childhood experiences. *Applied Cognitive Psychology, 9*, 181–197.
- Hyman, I. E., & Pentland, J. (1996). The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language, 35*, 101–117.
- Krafka, C., & Penrod, S. (1985). Reinstatement of context in a field experiment on eyewitness identification. *Journal of Personality and Social Psychology, 49*, 58–69.
- Lindsay, R. C. L., Lea, J. A., & Fulford, J. A. (1991). Sequential lineup presentation: Technique matters. *Journal of Applied Psychology, 76*, 741–745.
- Lindsay, R. C. L., & Wells, G. L. (1985). Improving eyewitness identification from lineups: Simultaneous versus sequential lineup presentations. *Journal of Applied Psychology, 70*, 556–564.
- Lindsay, R. C. L., Wells, G. L., & Rumpel, C. (1981). Can people detect eyewitness identification accuracy within and between situations? *Journal of Applied Psychology, 66*, 79–89.
- Loftus, E. F. (1996). *Eyewitness testimony* (2nd ed.). Cambridge, MA: Harvard University Press.
- Loftus, E. F., Coan, J. A., & Pickrell, J. E. (1996). Manufacturing false memories using bits of reality. In L. M. Reder (Ed.), *Implicit memory and metacognition* (pp. 195–220). Hillsdale, NJ: Erlbaum. (Original work published 1979)
- Loftus, E. F., & Doyle, J. M. (1997). *Eyewitness testimony: Civil and criminal* (3rd ed., Supp. 2000). Charlottesville, VA: LEXIS Law Press.
- Loftus, E. F., Fienberg, S. E., & Tanur, J. M. (1985). Cognitive psychology meets the national survey. *American Psychologist, 40*, 175–180.
- Loftus, E. F., & Greene, E. (1980). Warning: Even memory for faces may be contagious. *Law and Human Behavior, 4*, 323–334.
- Loftus, E. F., & Hoffman, H. G. (1989). Misinformation and memory: The creation of memory. *Journal of Experimental Psychology: General, 118*, 100–104.
- Loftus, E. F., & Ketcham, K. (1994). *The myth of repressed memory*. New York: St. Martin's Press.
- Loftus, E. F., Smith, K., Klinger, M., & Fiedler, J. (1992). Memory and mismemory for health events. In J. M. Tanur (Ed.), *Questions about questions: Inquiries into the cognitive bases of surveys* (pp. 102–137). New York: Russell Sage.
- Malpass, R. S., & Devine, P. G. (1981). Eyewitness identification: Lineup instructions and the absence of the offender. *Journal of Applied Psychology, 66*, 482–489.
- Mazzoni, G. A. L., & Loftus, E. F. (1998). Dreaming, believing, and remembering. In J. DeRivera & T. R. Sarbin (Eds.), *Believed-in imaginings* (pp. 145–156). Washington, DC: American Psychological Association.
- McCloskey, M., & Zaragoza, M. (1985). Misleading postevent information and memory for events: Arguments and evidence against memory-impairment hypotheses. *Journal of Experimental Psychology: General, 114*, 1–16.
- Meisner, C., & Brigham, J. C. (2001). Twenty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, and Law, 7*, 3–35.
- Paddock, J. R., Joseph, A. L., Chan, F. M., Terranova, S., Manning, C., & Loftus, E. F. (1998). When guided visualization procedures may backfire: Imagination inflation and predicting individual differences in suggestibility [Special issue]. *Applied Cognitive Psychology, 12*, S63–S75.
- Phillips, M. R., McAuliff, B. D., Kovera, M. B., & Cutler, B. L. (1999). Double-blind photoarray administration as a safeguard against investigator bias. *Journal of Applied Psychology, 84*, 940–951.
- Porter, S. (1998). *An architectural mind: The nature of real, created, and fabricated memories of emotional childhood events*. Doctoral dissertation, University of British Columbia, Vancouver, Canada.
- Porter, S., Yuille, J. C., & Lehman, D. R. (1999). The nature of real, implanted, and fabricated memories for emotional childhood events. *Law and Human Behavior, 23*, 517–538.

- Read, J. D. (1994). Understanding bystander misidentifications: The role of familiarity and contextual knowledge. In D. F. Ross, J. D. Read, & M. P. Tolia (Eds.), *Adult eyewitness testimony: Current trends and developments* (pp. 56–79). New York: Cambridge University Press.
- Scheck, B., Neufeld, P., & Dwyer, J. (2000). *Actual innocence*. New York: Random House.
- Shapiro, P. N., & Penrod, S. (1986). Meta-analysis of racial identification studies. *Psychological Bulletin, 100*, 139–156.
- Spanos, N. P., Burgess, C. A., Burgess, M. F., Samuels, C., & Blois, W. O. (1999). Creating false memories of infancy with hypnotic and non-hypnotic procedures. *Applied Cognitive Psychology, 13*, 201–218.
- Stebly, N. M. (1992). A meta-analytic review of the weapon focus effect. *Law and Human Behavior, 16*, 413–424.
- Stebly, N. M. (1997). Social influence in eyewitness recall: A meta-analytic review of lineup instruction effects. *Law and Human Behavior, 21*, 283–298.
- Technical Working Group on Crime Scene Investigations. (1999). *Crime scene investigations: A guide for law enforcement*. Washington, DC: United States Department of Justice, Office of Justice Programs.
- Technical Working Group for Eyewitness Evidence. (1999). *Eyewitness evidence: A guide for law enforcement*. Washington, DC: United States Department of Justice, Office of Justice Programs.
- Thomas, A., & Loftus, E. F. (2001). Unpublished manuscript, University of Washington, Seattle.
- Wells, G. L. (1978). Applied eyewitness testimony research: System variables and estimator variables. *Journal of Personality and Social Psychology, 36*, 1546–1557.
- Wells, G. L. (1984). The psychology of lineup identifications. *Journal of Applied Social Psychology, 14*, 89–103.
- Wells, G. L. (1993). What do we know about eyewitness identification? *American Psychologist, 48*, 553–571.
- Wells, G. L. (1995). Scientific study of witness memory: Implications for public and legal policy. *Psychology, Public Policy, and Law, 1*, 726–731.
- Wells, G. L., & Bradfield, A. L. (1998). Good, you identified the suspect: Feedback to eyewitnesses distorts their reports of the witnessing experience. *Journal of Applied Psychology, 83*, 360–376.
- Wells, G. L., & Luus, E. (1990). Police lineups as experiments: Social methodology as a framework for properly-conducted lineups. *Personality and Social Psychology Bulletin, 16*, 106–117.
- Wells, G. L., Malpass, R. S., Lindsay, R. C. L., Fisher, R. P., Turtle, J. W., & Fulero, S. (2000). From the lab to the police station: A successful application of eyewitness research. *American Psychologist, 55*, 581–598.
- Wells, G. L., & Olson, E. A. (2001). The other-race effect in eyewitness identification: What do we do about it? *Psychology, Public Policy, and Law, 7*, 230–246.
- Wells, G. L., Rydell, S. M., & Seelau, E. P. (1993). On the selection of distractors for eyewitness lineups. *Journal of Applied Psychology, 78*, 835–844.
- Wells, G. L., Small, M., Penrod, S., Malpass, R. S., Fulero, S. M., & Brimacombe, C. A. E. (1998). Eyewitness identification procedures: Recommendations for lineups and photospreads. *Law and Human Behavior, 22*, 603–647.
- Woodhead, M. M., Baddeley, A. D., & Simmonds, D. C. (1979). On training people to recognize faces. *Ergonomics, 22*, 333–343.
- Yuille, J. C., & Tollestrup, P. A. (1990). Some effects of alcohol on eyewitness memory. *Journal of Applied Psychology, 75*, 268–273.