



Rethinking the Reliability of Eyewitness Memory

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THE RELIABILITY OF EYEWITNESS CONFIDENCE

1

Rethinking the Reliability of Eyewitness Memory

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THE RELIABILITY OF EYEWITNESS CONFIDENCE

2

Abstract

Although certain pockets within the broad field of academic psychology have come to appreciate that eyewitness memory is more reliable than was once believed, the prevailing view, by far, is that eyewitness memory is unreliable – a blanket assessment that increasingly pervades the legal system. On the surface, this verdict seems unavoidable because (1) research convincingly shows that memory is malleable, and (2) eyewitness misidentifications are known to have played a role in most of the DNA exonerations of the innocent. However, we argue here that, like DNA evidence and other kinds of scientifically validated forensic evidence, eyewitness memory is reliable if it is not contaminated and if proper testing procedures are used. This conclusion applies to eyewitness memory broadly conceived, whether the test involves recognition (from a police lineup) or recall (during a police interview). From this perspective, eyewitness memory has been wrongfully convicted of mistakes that are better construed as having been committed by other actors in the legal system, not by the eyewitnesses themselves. Eyewitnesses typically provide *reliable* evidence on an initial, uncontaminated memory test, and this is true even for most of the wrongful convictions that were later reversed by DNA evidence.

Keywords: eyewitness identification, confidence and accuracy, Cognitive Interview

THE RELIABILITY OF EYEWITNESS CONFIDENCE

3

Rethinking the Reliability of Eyewitness Memory

In the view of many, if there is one fact that has been conclusively established by psychological science over the last 30-40 years it is that eyewitness memory is unreliable. And in one important way, there is no doubt that it is. Beginning in the 1970s, Elizabeth Loftus discovered the once-surprising but now uncontroversial fact that memory is *malleable*. With surprising ease, for example, participants in a memory experiment can be led to believe that they saw a stop sign when they actually saw a yield sign (Loftus, Miller & Burns, 1978) or that they became lost in a shopping mall as a child when no such experience actually occurred (Loftus & Pickrell, 1995).

The unfortunate malleability of memory has had tragic consequences in the legal system. For example, during the 1980s, a moral panic over day-care sexual abuse was later attributed to the unintentional implantation of false memories in young children during suggestive interviews (Bruck & Ceci, 1995; Ceci & Bruck, 1993; Ceci, Loftus, Leichtman & Bruck, 1994). Similarly, during the repressed memory epidemic in the 1990s, adult patients in psychotherapy sometimes recovered childhood memories of having been sexually abused by their parents. Incredibly, parents were occasionally charged and convicted of sexual abuse based on evidence consisting of nothing more than the recent recovery of a long-repressed memory from childhood. Only later did it become clear that many of those apparently recovered memories were actually unintentionally implanted by psychotherapists as they repeatedly probed a patient's childhood memories using techniques like "guided imagery" (Loftus, 2003; Loftus & Ketcham, 1994).

Although those moral panics have largely subsided, the malleability of memory continues to plague the legal system because events that occur during ordinary criminal investigations can have the effect of contaminating the memory of eyewitnesses, who then end up misidentifying

THE RELIABILITY OF EYEWITNESS CONFIDENCE

4

innocent suspects or reporting events that did not occur. Indeed, eyewitness misidentifications are known to have played a role in 70% of the 350 convictions that have been overturned based on DNA evidence since 1989 (Innocence Project, 2017).

In light of psychological research demonstrating how malleable memory is, and in light of the tragic consequences this has had in the legal system, it is perhaps not surprising that psychological science has rendered a verdict that now appears in virtually every textbook that addresses the issue: Eyewitness memory is unreliable. The purpose of this article is to suggest that it is time for that verdict to change. Against the notion that eyewitness memory is unreliable, we propose the following alternative perspective:

Just as is true of other kinds of scientifically validated forensic evidence, eyewitness memory is *reliable* when it is not contaminated and when proper testing procedures are used.

This perspective concerning the reliability of eyewitness memory conflicts with what most researchers appear to believe and with what virtually every textbook that addresses the matter has to say about it.

The Prevailing Verdict on Eyewitness Memory

Evidence supporting the idea that eyewitness memory is widely perceived to be inherently unreliable is abundant. First, a search of Google using the exact (quoted) phrase "eyewitness memory is unreliable" yields 2250 hits. By contrast, a search of the exact phrase "eyewitness memory is reliable" yields only 2 hits (search conducted on Feb. 11, 2017). Second, the Wikipedia entry on [eyewitness identification](#) (retrieved on Feb. 11, 2017) quotes the late U.S.

THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 Supreme Court Justice William J. Brennan, Jr. as saying that "At least since United States v.
4 Wade, 388 U.S. 218 (1967), the Court has recognized the inherently suspect qualities of
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6 eyewitness identification evidence, and described the evidence as 'notoriously unreliable.'" The
7
8 rest of the entry is written as if to validate Justice Brennan's decades-old impression of
9
10 eyewitness memory. Third, many psychology textbooks convey the message that eyewitness
11
12 memory is unreliable, as readers can easily confirm for themselves if there is an introductory
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14 psychology text (or, perhaps, a social psychology text or memory text) on a nearby bookshelf.
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16 The following paragraph from a freely available [online psychology text](#) seems representative and
17
18 will likely sound familiar to most readers:
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25 Psychological researchers who began programs in the 1970s, however, have consistently articulated
26
27 concerns about the accuracy of eyewitness identification. Using various methodologies, such as filmed
28
29 events and live staged crimes, eyewitness researchers have noted that mistaken identification rates can be
30
31 surprisingly high and that eyewitnesses often express certainty when they mistakenly select someone from
32
33 a lineup. Although their findings were quite compelling to the researchers themselves, it was not until the
34
35 late 1990s that criminal justice personnel began taking the research seriously (Cognitive Psychology and
36
37 Cognitive Neuroscience/Memory, 2017).
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41 Are there any conditions under which eyewitness memory is highly reliable? If so, this textbook
42
43 does not say. In our experience, the most any textbook ever says beyond listing the *many* ways in
44
45 which eyewitness memory can go wrong (complete with illustrations of real-life tragedies
46
47 attributed to eyewitness misidentification) is to briefly acknowledge that eyewitness memory is
48
49 not always inaccurate. Nearly every textbook treatment of eyewitness memory that we have seen
50
51 is written as if the author's primary responsibility is to disabuse readers of the dangerous idea
52
53 that eyewitness memory might be a reliable form of forensic evidence.
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57 Although we have not surveyed every psychology textbook, we feel safe in suggesting
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59 that no textbook leaves a reader with the impression that eyewitness memory is reliable in the
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61 same way that DNA evidence and fingerprint evidence are reliable (National Research Council,
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63 2009; Thompson, Tangen & McCarthy, 2014), namely, when the evidence is not contaminated
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 and when proper testing procedures are used. Instead, most textbooks leave the impression that
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5 almost everyone in our field has, which is that eyewitness memory is simply unreliable. This
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7 widespread impression is now enshrined in amicus briefs on the reliability of eyewitness
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9 memory that have been filed by the American Psychological Association (APA). These legal
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11 documents state that their conclusions about eyewitness memory are based on scientific research
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13 and that they enjoy almost unanimous support in the field. A recent (American Psychological
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15 Association, 2014) amicus brief states:

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20 Importantly, error rates can be high even among the most confident witnesses. Researchers have performed
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22 studies that track, in addition to identification accuracy, the subjects' estimates of their confidence in their
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24 identifications. In one article reporting results from an empirical study, researchers found that among
25
26 witnesses who made positive identifications, as many as 40 percent were mistaken, yet they declared
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28 themselves to be 90 percent to 100 percent confident in the accuracy of their identifications (pp. 17-18).

29
30 Another APA amicus brief (American Psychological Association, 2016) asserts that:

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32 Moreover, although the unreliability of eyewitness identifications is well known in the scientific
33
34 community and among many lawyers, it is not understood by lay juries (p. 9).

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36 Similar assertions can be found in a recent amicus brief filed by the Innocence Project (e.g.,
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38 Innocence Project, 2013).

39
40 It is not hard to understand how the field of psychology arrived at its generally negative
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42 assessment of the reliability of eyewitness memory. At least until the 1970s, and to some extent
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44 still today, the legal system operated as if the testimony of a credible and confident eyewitness
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46 was essentially infallible. Experimental psychologists in general (and Elizabeth Loftus in
47
48 particular) awakened the legal system to the fact that eyewitness memory is malleable and is
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50 therefore not immune to contamination. It was a groundbreaking development that inspired new
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52 recommendations about forensic interviews and eyewitness identification procedures (e.g.,
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54 Newlin, et al., 2015; Wells, Small, Penrod, Malpass, Fulero & Brimacombe, 1998; Technical
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56 Working Group for Eyewitness Evidence, 1999; Police and Criminal Evidence code, 2011).
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58 Despite these positive developments, we submit that the once surprising revelation about the
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 malleability of eyewitness memory has led to a severe overcorrection such that the field now
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5 regards eyewitness memory not only as being potentially unreliable but as being inherently
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7 unreliable. In our view, the evidence does not support this idea and instead clearly refutes it.
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When is Forensic Evidence Reliable? The DNA analogy

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12 Before addressing the issue of how reliable eyewitness memory is, it is important to
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14 consider two points about when forensic evidence qualifies as being reliable. First, few would
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16 dispute the idea that, as a general rule, forensic evidence of any kind can be contaminated. Thus,
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18 the fact that eyewitness memory can be contaminated is not a distinguishing feature of that type
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20 of evidence. Even DNA evidence can be contaminated, either before it arrives at the laboratory
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22 or if improper testing procedures are used in the laboratory itself. Indeed, there are multiple
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24 examples of evidence becoming contaminated with the DNA of an innocent person, ultimately
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26 resulting in a wrongful conviction (Opar, 2006; Thompson, 2013). Nevertheless, such cases are
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28 rare because police investigators and forensic DNA scientists are well aware of the risk of
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30 contamination, and they take appropriate steps to avoid that problem. With regard to laboratory
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32 protocols, for example, the FBI has issued a document entitled "Quality Assurance Standards for
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34 Forensic DNA Testing Laboratories" (2011), which spells out requirements for annual laboratory
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36 audits and semiannual proficiency testing for DNA analysts to ensure that an accredited DNA
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38 laboratory is in compliance with FBI standards. When the forensic evidence is not contaminated
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40 and proper testing protocols are followed, DNA evidence is extraordinarily reliable (National
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42 Research Council, 2009). Thus, the mere fact that forensic evidence can be easily contaminated
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44 is not an automatic indictment of its reliability.
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53 The second important point about judging the reliability of forensic evidence concerns
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55 the interpretation of a test result when (1) the evidence was not contaminated and (2) the test was
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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properly performed. Critically, even under these conditions, a test result can be inconclusive. Consider again DNA evidence. Does a properly conducted DNA test of uncontaminated evidence from a crime scene conclusively identify the perpetrator or conclusively exclude an innocent suspect every time? Of course not. The results of a DNA test are summarized in a graph known as an "electropherogram," which displays a series of sharp peaks reflecting the amount of DNA detected at various locations (loci) on the chromosomal material (Thompson, Ford, Doom, Raymer & Krane, 2003). In a pristine single-source DNA profile, the electropherogram will exhibit either one or two peaks (representing alleles) at each of 20 different loci.¹ If the peaks of an unknown DNA profile obtained from the crime scene evidence match all of the peaks from the known DNA profile obtained from a suspect, then the odds that the unknown sample was deposited by another person (not by the suspect) are infinitesimally small. However, sometimes, the crime-scene DNA evidence is degraded such that only a partial DNA profile is obtained (i.e., peaks are evident for only some of the 20 loci). This can occur even though the crime-scene evidence was not contaminated and even though proper testing procedures were followed in the crime laboratory. In that case, the results (i.e., a partial match) might not conclusively implicate the suspect.

An important component of a DNA test result is that it includes an indication of how definitive the results are. For example, the test result might indicate that while a partial profile of an unknown individual is consistent with the full DNA profile of the known suspect, there is a 1 in 4 chance that it would also be consistent with the full DNA profile of a randomly selected individual from the population. Under those conditions, the DNA test result would not constitute strong evidence against the suspect. Other test results might put the odds at 1 in 100, 1 in 100

¹ In 1997, the FBI selected 13 loci to constitute the core of the United States national database, CODIS, but as of January 1, 2017, the number of core loci was [increased](#) to 20.

THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 thousand, or 1 in 100 trillion, depending on how intact the DNA on the crime-scene evidence is.

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5 The lower the odds that a randomly selected individual would yield a profile consistent with the
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8 DNA profile from the crime scene evidence, the more certain one can be that the unknown DNA
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10 belongs to the suspect.

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13 If it often happened that a properly conducted DNA test result associated with a random
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15 match probability of 1 in 4 was used to convict suspects, many innocent people would end up in
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17 prison. However, as tragic as that would be, those wrongful convictions would not be an
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19 indication that DNA tests are inherently unreliable. Instead, it would be an indication that the
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21 criminal justice system is making an error by ignoring the random match probability that
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23 accompanied the DNA test result. From this perspective, forensic evidence is reliable not
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25 because it provides accurate information whenever it is used in an effort to determine if a suspect
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27 is innocent or guilty. Even DNA evidence is not reliable in that sense. Instead, forensic evidence
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29 is reliable if it includes a valid indication of how definitive the evidence is.
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34 As with DNA, no account of the reliability of eyewitness memory is complete without
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36 taking into consideration the degree to which eyewitnesses can inform police investigators that
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38 the information they just provided is or is not definitive. The equivalent of the random match
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40 probability in eyewitness memory is the confidence expressed by the eyewitness the first time
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42 memory is assessed. With that definition of reliability in mind, we next consider research
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44 pertaining to the reliability of eyewitness memory, first when it is tested by recognition (using a
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46 lineup) and then when it is tested by recall (during a police interview). Although these two
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48 research literatures are usually considered separately, our argument will be that the same lesson
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50 has been learned in both cases, namely, that eyewitness memory is reliable when the evidence is
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not contaminated, when proper procedures are followed, and when the confidence expressed by the eyewitness is taken into account.

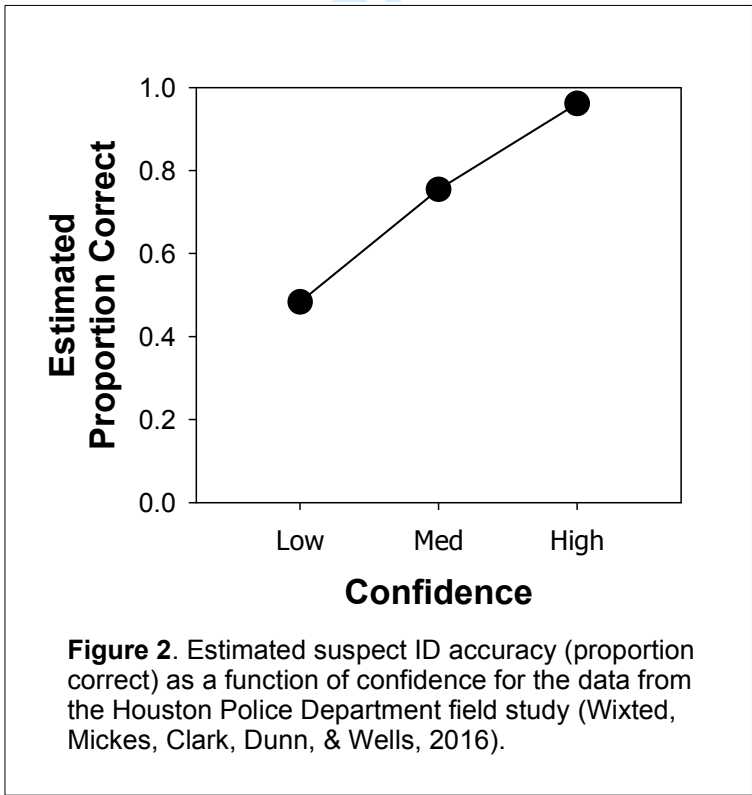
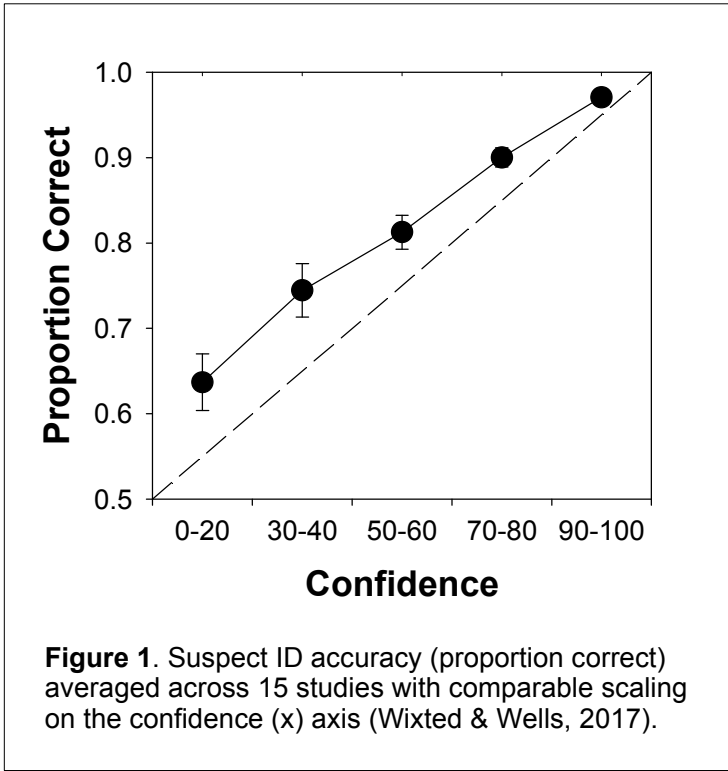
Eyewitness Identification Evidence from a Lineup (Recognition)

Wixted, Mickes, Clark, Gronlund, & Roediger (2015) proposed that eyewitness identification evidence from a police lineup is highly reliable in the sense described above. That is, like DNA evidence, on an initial test of uncontaminated memory using proper procedures, low confidence implies low accuracy, and high confidence implies high accuracy. This is not to suggest that high-confidence eyewitness evidence can achieve the astronomically high levels of accuracy that can be achieved with DNA evidence (e.g., when the random match probability is 1 in 100 trillion), but we do suggest that high-confidence IDs can achieve levels of accuracy that are far more impressive than is generally believed to be the case.

Recently, Wixted and Wells (2017) reviewed many laboratory studies and plotted suspect ID accuracy as a function of confidence on a 100-point scale. The dependent measure used in their analyses addresses the question of greatest interest to judges and juries in a case involving eyewitness identification: Given that the witness identified the suspect with a certain level of confidence, what is the probability that the suspect ID was accurate? Figure 1 reproduces their summary figure based on 15 simulated crime studies. Obviously, high-confidence implies very high accuracy and low-confidence implies much lower accuracy. Wixted, Mickes, Dunn, Clark and Wells (2016) reported similar results from the Houston Police Department field study, shown here in Figure 2. The latter study is particularly important because it provides evidence that in actual practice (with real eyewitnesses), memory is reliable on an initial uncontaminated test using proper testing procedures.

THE RELIABILITY OF EYEWITNESS CONFIDENCE

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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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Only the first memory test counts

The field of psychology has been slow to appreciate the strong relationship between confidence and accuracy – and, therefore, to appreciate how reliable eyewitness identification is – for at least three reasons. First, memory is malleable and the very act of testing memory contaminates it by making it stronger than it was before. Thus, on subsequent memory tests, eyewitnesses will experience a stronger memory match signal than they did on the first test and more confidently identify a suspect – whether that suspect is innocent or guilty (e.g., Steblay & Dysart, 2016). The implication is that only the first test of an eyewitness's memory can provide untainted forensic evidence (Wixted et al., 2015), and that fact needs to be taken into consideration in any discussion about the reliability of eyewitness memory. Many have conflated contaminated memory tests (namely, the eyewitness identification test that occurs at trial) and uncontaminated memory tests (namely, the initial memory test conducted using a properly constructed lineup) when forming an opinion about the reliability of eyewitness memory. Yes, contaminated memory evidence is unreliable (just as contaminated DNA evidence is), but no, that fact does not indicate that eyewitness memory is *inherently* unreliable. To ask whether or not eyewitness evidence (or DNA evidence or fingerprint evidence) is reliable is to ask whether or not it is reliable when the evidence is not contaminated, when proper testing procedures are used, and when confidence is taken into account. For eyewitness identification, because only the first test provides a test of uncontaminated memory, its reliability must be judged in relation to that first test.

The “correlation” between confidence and accuracy is irrelevant

The second reason why the field has been slow to appreciate that eyewitness identification evidence is reliable is that early studies into the confidence-accuracy relationship

THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 suggested that the relationship is weak or, at best, moderate even on an initial uncontaminated
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5 test using a pristine lineup procedure (Penrod & Cutler, 1995; Sporer, Penrod, Read, & Cutler,
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7 1995). If that were true, it would certainly support the claim that eyewitness identification
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9 evidence is inherently unreliable. However, it is now understood that the original conclusion
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11 about a weak-to-moderate confidence-accuracy relationship was based on the use of a
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13 problematic statistic – the point-biserial correlation coefficient – to measure that relationship
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15 (Juslin, Winman & Olson., 1996; Wixted & Wells, 2017). The most straightforward way to
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17 communicate the confidence-accuracy relationship for cases in which a suspect has been
18
19 identified from a lineup is to simply plot suspect ID accuracy as a function of confidence
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21 (Mickes, 2015), as we have done here in Figures 1 and 2. When plotted that way, the confidence-
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23 accuracy relation is impressively strong.
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Suboptimal memory conditions

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31 The third reason why eyewitness identification evidence has long been judged to be
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33 unreliable is the belief that for a strong confidence-accuracy relationship to hold, not only must
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35 an appropriate test be administered, but the memory conditions at the time of the crime must be
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37 favorable as well. For example, the “optimality hypothesis” (Deffenbacher, 1980, 2008) holds
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39 that confidence becomes less indicative of accuracy under suboptimal conditions (e.g., high
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41 stress, the presence of a weapon, racial differences between the witness and the perpetrator, short
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43 exposure duration, long retention interval, etc.). However, the evidence collected to date suggests
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45 that variables such as these do not appreciably affect the accuracy of initial identifications made
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47 with high confidence (Mickes, 2015). The relevant studies were reviewed by Wixted and Wells
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49 (2017), with key results summarized in their Figures 4c (weapon present or absent), 4d (weapon
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51 present or absent again), 4f (same-vs.-cross-race), 4h (short vs. long retention intervals), 4i (short
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 vs. long retention intervals and short vs. long exposure durations), 4m (full vs. divided attention),
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5 4n (short vs. long retention interval again), and 4p (short vs. long retention interval again).

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8 Although these variables had the expected negative effect on the overall accuracy of memory
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10 (because, for example, memory fades following a long retention interval), they did not diminish
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12 the accuracy of suspect IDs made with high confidence.

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15 The results of these studies help to further clarify the difference between “reliability” and
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17 overall “accuracy.” To say that a long retention interval reduces the overall accuracy of
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19 eyewitness memory means that eyewitness will make more mistakes following a long retention
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21 interval compared to a short retention interval. However, it does not automatically follow that the
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23 information provided by eyewitnesses when they make a suspect ID under unfavorable memory
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25 conditions is any less reliable. For example, following a short retention interval, almost all
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27 suspect IDs might be accurate and also be accompanied by high confidence. Following a long
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29 retention interval, some suspect IDs might be accurate and accompanied by high confidence, but
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31 most suspect IDs might be inaccurate and accompanied by low confidence. Overall suspect ID
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33 accuracy will be lower after a long retention interval because most of what is remembered
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35 consists of low-confidence, low-accuracy IDs, but reliability might be unaffected in that high-
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37 confidence IDs, although less likely to occur, are as accurate as ever. It is therefore no
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39 contradiction to say that variables like high stress, weapon focus, and long retention interval
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41 reduce overall accuracy without necessarily affecting the reliability of suspect IDs made with
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43 high confidence.

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46 The results of these laboratory studies help to make sense of the police department field
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48 study results summarized here in Figure 2. In the Robbery Division of the Houston Police
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50 Department, more than 60% of the IDs are cross-race IDs, and more than 70% of robberies
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 involve the presence of a weapon (Wells, Campbell, Li & Swindle, 2016). Given that a weapon
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5 was often present, one can reasonably assume that eyewitness stress is often high. Even so, just
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7 as in laboratory studies involving other variables that negatively affect overall accuracy, high-
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9 confidence IDs were estimated to be highly accurate.
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13 With these findings in mind, it is worth revisiting the DNA exoneration cases – the ones
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15 in which 70% were based on eyewitness misidentifications. In his 2011 book *Convicting the*
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17 *Innocent: Where Criminal Prosecutions Go Wrong*, Garrett (2011) analyzed trial materials for
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19 161 DNA exonerees who had been misidentified by one or more eyewitnesses in a court of law.
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21 In every case, the eyewitness testified with high confidence at trial that the defendant was the
22
23 perpetrator. However, IDs that occur at trial are not initial IDs. Therefore, by itself, that fact only
24
25 shows that contaminated memory is unreliable (something that was not widely appreciated in the
26
27 pre-Loftus era but now is, at least among experimental psychologists). Critically, in 57% of those
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29 cases, information was available about the level of confidence expressed on the initial
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31 (presumably uncontaminated) memory test. In every one of those cases, the same eyewitnesses
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33 who were highly confident in their misidentifications at trial were, at best, initially *uncertain*. In
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35 other words, on the one and only test that counts (the initial uncontaminated memory test), the
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37 result was a lot like an inconclusive DNA test that comes back indicating that the DNA profile
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39 on the crime scene evidence, although consistent with the suspect, is also consistent with a high
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41 proportion of the population. Presumably, most prosecutors would not try to convict someone on
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43 the strength of such weak evidence alone. The fact that similarly weak eyewitness evidence from
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45 an initial test ended up convicting a large number of innocent defendants does not mean that
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47 eyewitness memory is inherently unreliable. Instead, it means that the legal system ignored the
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 results of a valid initial test based on uncontaminated eyewitness evidence and instead
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5 unwittingly used contaminated eyewitness evidence to win a conviction.
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Eyewitness Evidence from a Police Interview (Recall)

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10 The considerations discussed above pertain to eyewitness identification (recognition
11 memory), but similar considerations apply to information obtained from interviewing
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13 eyewitnesses about a crime they observed (recall memory). For example, just as lineup
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15 administrators can distort eyewitness recognition to generate incorrect identifications, so too can
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17 interviewers distort eyewitness recall to generate incorrect descriptions. Such error-inducing
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19 techniques include (a) asking suggestive questions or otherwise introducing post-event
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21 misinformation (Loftus, Miller & Burns, 1978), (b) asking an abundance of closed questions (vs.
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23 open-ended questions: Lamb, Orbach, Hershkowitz, Horowitz & Abbott, 2007), and (c)
24
25 encouraging/enticing witnesses to guess (vs. providing an option not to respond: Earhart, La
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27 Rooy, Brubacher & Lamb, 2014). When these avoidable error-inducing interview techniques are
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29 avoided, however, as in the Cognitive Interview (Fisher & Geiselman, 1992) or the National
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31 Institute of Child Health and Human Development (NICHD) protocol (Orbach, Hershkowitz,
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33 Lamb, Sternberg, Esplin & Horowitz, 2000), witness descriptions can be quite accurate. We next
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35 consider research on the accuracy of information that is elicited from adults using proper
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37 interview techniques in laboratory studies and police department field studies.
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Laboratory Studies of Eyewitness Recall

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48 Laboratory studies typically have participants view a mock-crime (as in laboratory
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50 studies of eyewitness identification), after which different interviewing strategies are compared
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52 (e.g., the Cognitive Interview vs. a standard police interview protocol). Although most studies
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54 are concerned with the ability of a structured interview like the Cognitive Interview to elicit
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 *more* information than alternative techniques, many studies also report the accuracy of the
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5 obtained information. In an early meta-analysis of the literature, Koehnken, Milne, Memon and
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7 Bull (1999) determined that the Cognitive Interview elicited significantly more information than
8
9 alternative interviews. More important for present purposes, they also found that "...accuracy (as
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11 measured by the proportion of all witness statements that were correct) was as high or slightly
12
13 higher in the CI interviews (accuracy rate = 0.85) than in the comparison interviews (0.82)" (p.
14
15 63). Comparable accuracy scores were recently reported by Rivard, Fisher, Robertson and Hirn
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17 Mueller (2014) in a more realistic study in which participants were asked to recall the details of a
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19 meeting they had attended at a training center for federal investigators 3 to 43 days earlier. The
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21 interviewers were staff members who conduct training programs on investigative interviewing at
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23 the training center. The Cognitive Interview again outperformed a standard interview in terms of
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25 the amount of information elicited (the usual result). Critically, of the recalled information that
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27 could be corroborated (based on records of the meeting provided by the training facility), the
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29 accuracy rates were 88% correct and 87% correct for the Cognitive Interview and a standard
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31 interview protocol, respectively. Accuracy rates that fall in the 85% to 90% correct range
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33 indicate that eyewitness recall for details is not perfect, but such results are hard to reconcile with
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35 the prevailing notion that eyewitness memory is simply unreliable.
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44 The high accuracy rates noted above, which were found in controlled laboratory studies,
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46 are instructive, but may not be representative of performance in real-world investigations. Note
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48 that most laboratory studies (1) use undergraduate student witnesses, who may have better
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50 memory or verbal skills than typical victims and witnesses of real crime, and (2) use graduate
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52 Research Assistant interviewers, who may ask easier questions than real-world police
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54 investigators – although as noted above Rivard et al. (2014) used non-student witnesses and
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 professional interviewers (see also Mosser, Fisher, Molinaro, Satin & Manon, 2015).

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5 Furthermore, laboratory studies are often designed to detect differences across conditions and so
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7 they are engineered to avoid ceiling and floor effects, in which case the absolute levels of
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9 performance may not be informative. We should therefore look to field studies, of actual victims
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11 and witnesses to crime, to see whether the high witness accuracy rates still hold.
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Field Studies of Eyewitness Recall

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17 In an early police department field study, Fisher, Geiselman and Amador (1989) trained 7
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19 experienced detectives from the Robbery Division of the Metro-Dade Police Department to use
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21 the Cognitive Interview and compared their performance against 9 untrained, but equally
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23 experienced, detectives. As in laboratory studies, the trained detectives elicited considerably
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25 more information than the untrained detectives did. Because the ground truth of recalled
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27 information was unknown, it was estimated using various sources of corroboration (mainly
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29 reports from other witnesses interviewed immediately after the crime). Overall corroboration
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31 rates exceeded 93% for both the Cognitive Interview and the standard interview protocol. These
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33 findings suggest that, if anything, real eyewitnesses may be slightly *more* accurate than what is
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35 suggested by laboratory studies (see also van Koppen & Locun, 1993; Yuille & Cutshall, 1986).
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37 One obvious limitation of this interpretation is that the measure of accuracy used in this study –
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39 corroboration across witnesses – is imperfect, as it is possible for two witnesses to be consistent
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41 with each other, but both are wrong. More recent studies of real-crime witnesses relied on purer
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43 measures of accuracy.
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51 Several studies have taken advantage of the fact that crimes are sometimes captured on
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53 closed-circuit television (CCTV). Those CCTV images can then be used to directly validate the
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55 information later recalled by eyewitnesses. In the first study making use of CCTV images,
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 Woolnough and MacLeod (2001) examined archived police records and identified eight
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5 incidents of assault that involved both a victim and a bystander. Most of the elicited information
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7 was about the crime events, not descriptions of the perpetrator. The action details recalled by the
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9 witnesses included events such as the victim being knocked to the ground, a man and a woman
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11 having an argument and pushing each other, good Samaritans breaking up a fight, etc. In this
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13 study, both victims and bystanders were found to be highly accurate: Both achieved accuracy
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15 scores of 96% correct. In another CCTV-corroborated field study, eyewitnesses provided
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17 descriptions of the perpetrators of armed robberies in Oslo, Norway (Fahsing, Ask & Granhag,
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19 2004). Of the verifiable attributes, 87% were correct. Again, findings like these seem impossible
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21 to reconcile with the notion that eyewitness memory is generally unreliable.
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27 Keep in mind that our focus is on an initial test of memory that occurs prior to
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29 experiences that may contaminate witness memory (just as DNA evidence can be contaminated).
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31 A good illustration of how contamination can reduce the reliability of information obtained from
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33 a police interview comes from an archival police study of 29 people who witnessed the murder
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35 of Swedish Foreign Minister Anna Lindh (Granhag, Ask, Rebelius, Ohman, & Giolla, 2013). In
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37 this case, only 58% of the reported attributes were correct, as corroborated by CCTV. According
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39 to the authors, the most likely explanation for the poor performance was memory contamination
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41 that occurred because, prior to being interviewed, the witnesses were gathered together and
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43 discussed the event. These findings underscore the fact that our claims about the surprisingly
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45 high reliability of eyewitness memory pertain to tests of memory that are conducted prior to
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47 memory contamination.
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53 In all, laboratory studies of eyewitness memory that employ generally accepted
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55 interviewing protocols and do not intentionally provide misleading information or entice
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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witnesses to guess find that accuracy is quite high (ca. 85% - 90%). Field studies of police interviews with victims and witnesses of real crime show, if anything, even higher rates of accuracy. On the surface, this finding might seem hard to reconcile with reports showing that police interviewers often do not follow optimal interview procedures (Fisher, Geiselman, & Amador, 1987; Snook & Keating, 2011). However, analyses of police interviews show that the police likely elicit *less* information than is potentially available; they do not typically use techniques that increase the risk of eliciting inaccurate information. They elicit less information than they could because they typically do not make use of empirically validated techniques for maximizing the quantity of recalled information, such as the techniques used in the Cognitive Interview (e.g., context reinstatement, witness-compatible questions, encourage active witness participation, etc.). Nevertheless, at least when interviewing cooperative witnesses, the police rarely ask blatantly suggestive questions or offer misleading information, procedures that are known to contribute to witness error. Thus, we would expect to find that training police to use the Cognitive Interview increases the amount of information elicited but not the accuracy of witness reports because accuracy is already high.

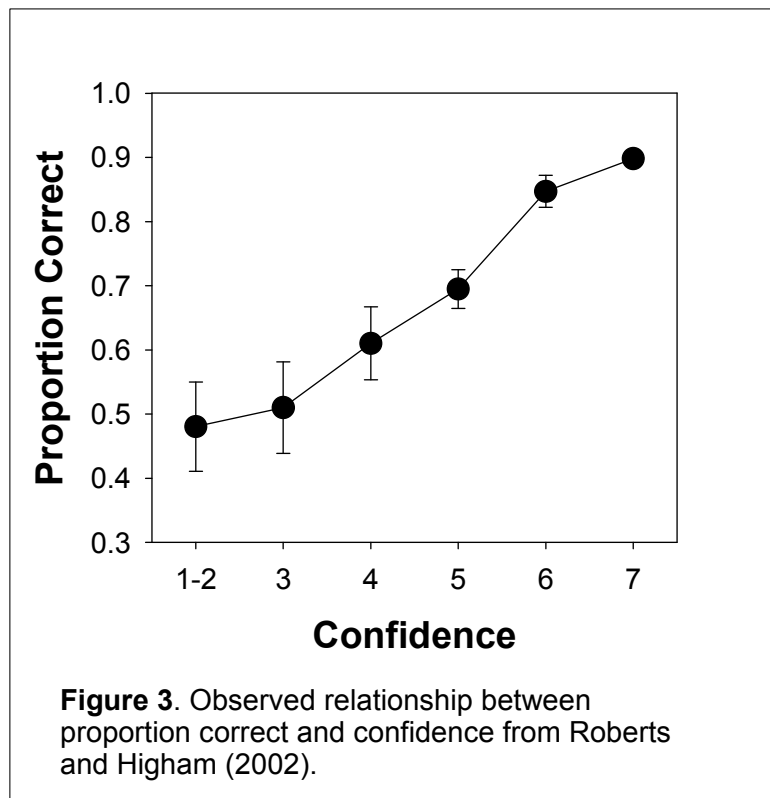
Eyewitness Confidence and Recall Accuracy

We noted earlier, when discussing eyewitness identification (recognition memory), that, under proper testing conditions, confidence was a good indicator of accuracy. How well does eyewitness confidence indicate accuracy when eyewitnesses are describing a recollected event (recall memory)? Several laboratory and field studies converge on the conclusion that eyewitness confidence also predicts recall accuracy.

Roberts and Higham (2002) conducted one of the first laboratory studies to examine confidence as a predictor of eyewitness recall accuracy. After watching a videotape of a

THE RELIABILITY OF EYEWITNESS CONFIDENCE

simulated robbery, laboratory witnesses were interviewed about their recollections of the event. Following an initial free narrative report, witnesses were asked follow-up questions to elaborate on their initial recollections. Witnesses were then asked to make confidence judgments (using a



1-to-7 scale) about each detail that was reported earlier. We estimated the overall number of correct and incorrect details for each level of confidence from their Figure 1 and then computed the probability that a recalled detail was correct for each level of confidence. That is, for each level of confidence, we computed $\frac{\# \text{ correct details}}{\# \text{ correct details} + \# \text{ incorrect details}}$

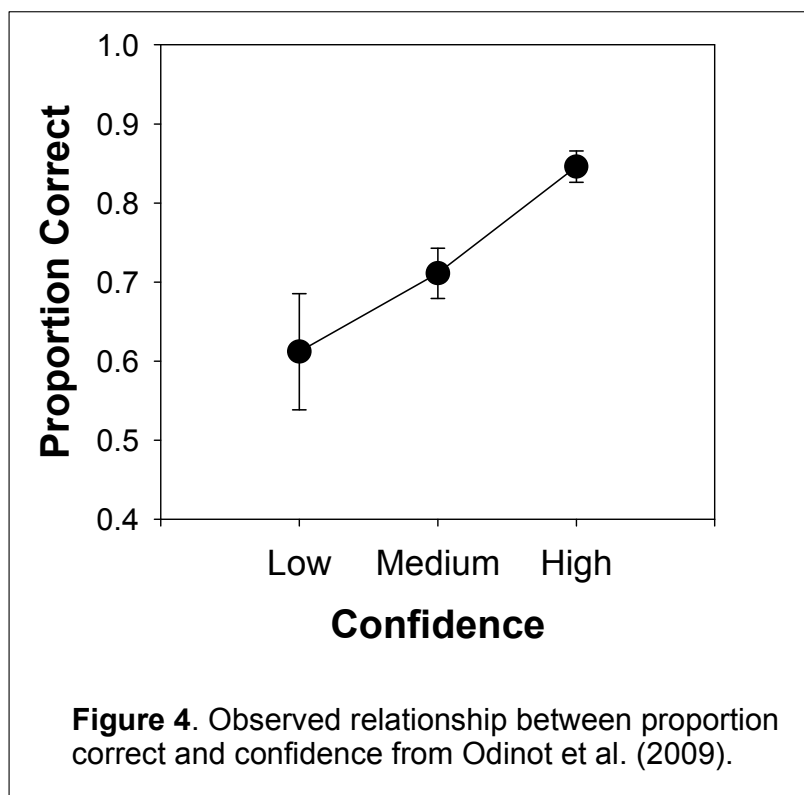
details) to create the recall version of a CAC plot. Because very few details were recollected with confidence ratings of 1 or 2, we collapsed across those two confidence ratings. The results are shown here in Figure 3. Obviously, as with the recognition studies considered earlier, confidence was strongly related to accuracy, and high confidence was associated with high accuracy.

Odinot, Wolters, and van Koppen (2009) extended the Roberts and Higham (2002) laboratory study to a more naturalistic and stressful setting, an armed robbery of a supermarket. Three months after the crime, Odinot et al. interviewed eyewitnesses about details of the crime. After the witnesses described the event, the experimenters asked the witnesses to make confidence judgments (1-7 scale) about each detail they had provided earlier. Odinot et al. (2009)

THE RELIABILITY OF EYEWITNESS CONFIDENCE

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measured the relationship between confidence in recollected details and the accuracy of those recollections by computing a gamma correlation coefficient (which, in their study, came to 0.38), but that approach suffers from the same problem as the point-biserial correlation coefficient used in eyewitness identification studies in that it is capable of masking a strong relationship (Roediger, Wixted & DeSoto, 2012). Instead of computing a correlation coefficient, it is more informative to simply plot the relationship between confidence and accuracy in a manner similar to the CAC plots shown here in Figures 1 and 2. The information needed to do so was reported by Odinot et al. (2009) in their Table 2. To create the recall version of the CAC plot, we



averaged across different categories (person descriptions, object descriptions, and action details) for the nine central witnesses interviewed in that study. In addition, because many responses were associated with high confidence (a rating of 7), whereas relatively few responses were made with confidence ratings of 1 through 6, we

computed weighted averages across categories to create a 3-point scale (low, medium and high confidence). Low confidence consisted of ratings of 1 through 3 (44 ratings in all), medium confidence consisted of ratings 4 through 6 (203 ratings), and high confidence consisted of ratings of 7 (326 ratings). Figure 4 shows that proportion correct increased from .61 to .85 as

THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 confidence increased from low to high. Again, high-confidence recollections, at 85% correct,
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5 despite being less than perfect, cannot be characterized as being unreliable.
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8 Even though the above findings are encouraging, we suspect that they may underestimate
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10 the predictive power of confidence, as in both the Roberts and Higham (2002) and Odinot et al.
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12 (2009) studies, the confidence judgments were made only after a delay (after witnesses reported
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14 several related details), i.e., these were not contemporaneous confidence judgments. Requiring
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16 interviewees to make a confidence judgment immediately after each recalled fact would disrupt
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18 the natural flow of a properly conducted interview. (We note that, although unnatural for a
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20 witness interview, it is very natural for witnesses doing a recognition/identification test to be
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22 asked immediately after each decision to indicate their level of confidence; e.g., You just picked
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24 number 5; how confident are you about that decision?) In order to examine confidence
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26 judgments made spontaneously within a recall task, but not disrupt the natural flow of a witness
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28 interview, other indirect measures of confidence can be used. Two such measures, which we
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30 discuss below, are (1) noticing when witnesses spontaneously use verbal expressions of
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32 (un)certainty, and (2) allowing witnesses to withhold low-confidence recollections.
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39 Paulo, Albuquerque, and Bull (2016) showed experimental witnesses a videotape of a
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41 simulated crime and then interviewed the witnesses by eliciting mainly uninterrupted narrative
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43 descriptions of the event. Whereas most of the witness statements were unqualified (e.g., “it was
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45 a red shirt”), they sometimes uttered verbal expressions to convey their uncertainty (e.g., “I think
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47 [or “maybe”] it was a red shirt.”). In keeping with the general principle that certainty indicates
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49 heightened accuracy, unqualified statements were correct 90% of the time, whereas statements
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51 preceded by expressions of uncertainty were correct only 65% of the time. Thus, even though the
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53 interviewers did not formally ask witnesses to indicate their level of certainty, spontaneous
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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measures of (un)certainly still emerged to distinguish between highly accurate and less accurate witness recollections.

Finally, witness confidence may be assessed unobtrusively by allowing witnesses to withhold uncertain responses or to say “I don’t know” (Koriat & Goldsmith, 1994). Presumably, if given the opportunity to withhold a response, witnesses will withhold the low-confidence responses. In a test of this hypothesis, Evans and Fisher (2011) showed experimental witnesses a brief crime video and then tested them with either free recall, cued recall, or Yes/No questions. Moreover, witnesses were either permitted to withhold responses (say “I don’t know”) or they were forced to answer all questions. As might be expected, witnesses were less confident about responses they withheld (and were later asked to report) than responses they provided voluntarily. In agreement with the results summarized in Figures 3 and 4, witnesses were very accurate for the high-confidence answers they provided voluntarily (probability correct = .91), but accuracy declined considerably when they were forced to also provide low-confidence responses (probability correct = .79).

Conclusion

Our main message is that when investigators probe eyewitness memory, either via identification procedures (recognition tests) or interviews (recall tests), the information they receive is likely to be very reliable if the following conditions are met: (1) witnesses were not previously exposed to distorting/contaminating information, (2) the witness’ memory is being probed for the first time, (3) witnesses are not “tricked” into providing desired information (e.g., through the use of biased lineups or suggestive interview questions), (4) the witness’s metacognitive monitoring guides his/her responding (either by withholding a response if uncertain or explicitly reporting his/her level of confidence), and (5) the investigator is sensitive

THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 to the witness's level of confidence (relying on high-confidence responses while attaching less
4 weight to low-confidence responses). When such conditions are met, eyewitness memory is
5 likely to be reliable – both in the laboratory and in the field – whether the test involves
6 recognition or recall. When such conditions are not met, eyewitness memory may be unreliable
7 – but that is hardly because of a faulty memory system.

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15 These considerations indicate how the message from experimental psychology – namely,
16 that eyewitness memory is inherently unreliable and that eyewitness confidence should be
17 disregarded – is incomplete, to say the least. The evidence we have reviewed here indicates that
18 eyewitness memory is reliable in the same way that DNA evidence is reliable. When proper
19 procedures are used, both DNA tests and eyewitness memory tests are accompanied by an
20 indication of how reliable the information is. For DNA tests, that information consists of the
21 random match probability. For memory tests, that information consists of an eyewitness's
22 confidence in the information that was just provided (with respect to either an ID made from a
23 lineup or an answer provided in response to an interview question). Ignoring that critical piece of
24 information can lead to tragic errors, including wrongful convictions of the innocent. Indeed,
25 ignoring the low confidence expressed by eyewitnesses on the initial memory test is exactly how
26 most of the innocent defendants who were supposedly wrongfully convicted because of the
27 unreliability of eyewitness memory ended up in prison in the first place (only to be exonerated
28 by DNA evidence years later). The same would be true if people were routinely convicted based
29 on inconclusive DNA evidence. Fortunately, so far as we know, the legal system does not make
30 that mistake when the forensic evidence involves a DNA test (i.e., if the test is inconclusive, that
31 evidence is not used to prosecute), but it does make that mistake when the forensic evidence
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 consists of an eyewitness memory test. Blaming the inevitable wrongful convictions on the
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5 unreliability of eyewitness memory is pointing the finger of blame in the wrong direction.
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8 It might be argued that the perspective we have advanced here is defensible in theory but,
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10 in practice, eyewitness evidence is so often mishandled that it is nevertheless valid to assert that
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12 eyewitness memory is (for all practical purposes anyway) inherently unreliable. However, for
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14 two reasons, we believe that this is not a viable position. First, keep in mind that in the DNA
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16 exoneration cases for which it could be determined what happened at the initial ID, the witnesses
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18 did *not* express high confidence. In fact, in none of the cases for which it could be determined
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20 what happened at the time of the initial ID was a witness both mistaken and highly confident
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22 (Garrett, 2011). These findings provide direct evidence that, by the time of the first ID in a
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24 typical police investigation, eyewitness memory is usually not contaminated to the point where a
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26 mistaken ID will happen with high confidence. That obviously can happen, but the available
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28 evidence suggests that it is not a frequent occurrence. If it were, one would expect to find many
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30 cases in which the initial ID in a DNA exoneration case were made with high confidence. So far,
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32 there is no such evidence.
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39 Second, many jurisdictions have adopted much improved eyewitness memory protocols
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41 in recent years. A recent DOJ memo, for example, instructed all federal law enforcement
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43 agencies to adopt "best practices" eyewitness identification protocols according to which a lineup
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45 should be fair (i.e., the suspect should not stand out), that it should contain only one suspect and
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47 that an initial statement of confidence should be obtained (Yates, 2017). In federal trials
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49 involving eyewitness identification evidence, should juries be told that eyewitness memory is
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51 inherently unreliable even if the DOJ guidelines were followed? That seems inappropriate to us.
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55 Instead, just as is true of trials involving DNA evidence, the jury should hear arguments about
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THE RELIABILITY OF EYEWITNESS CONFIDENCE

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3 whether or not proper testing protocols were adhered to so the jury can make an independent
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5 judgment about the reliability of the evidence. When memory is not contaminated and proper
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7 testing procedures are followed, eyewitness memory is clearly reliable. In our opinion, the cause
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9 of justice is not served by suggesting otherwise.
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For Review Only

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