Automaticity and Eyewitness Accuracy: A 10- to 12-Second Rule for Distinguishing Accurate From Inaccurate Positive Identifications

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Eyewitness researchers have shown that witnesses accurately choosing the culprit out of a lineup reach their decisions more quickly than those erroneously choosing an innocent individual. However, this research is silent regarding how quickly or slowly witnesses must be, in absolute terms, to indicate that they are accurate or inaccurate. Across 4 studies, the authors discovered that a time boundary of roughly 10 to 12 s best differentiated accurate from inaccurate positive identifications. Witnesses making their identification faster than 10 to 12 s were nearly 90% accurate; those taking longer were roughly 50% accurate. This finding is consistent with previous research showing that accurate witnesses are more likely than inaccurate witnesses to reach their decisions automatically, that is, quickly, without conscious thought or effort.

The use of eyewitness testimony in the legal system presents a fundamental and vexing paradox. Although eyewitness testimony is a common (Goldstein, Chance, & Schneller, 1989) and compelling (Devlin, 1976) form of evidence, psychological research since the 1970s shows that its reliability is, at best, fragile and inconsistent. Whether an eyewitness makes an accurate identification of a culprit from a lineup depends on a large number of situational and personal influences (for reviews, see Ross, Read, & Toglia, 1994; Sporer, Malpass, & Kohnken, 1996). Eyewitness accuracy can depend on the amount of time the culprit was in view during the crime (Laughery, Alexander, & Lane, 1971), the length of time between the crime and the viewing of the lineup (Lipton, 1977), whether the witness was exposed to misleading information before viewing the lineup (Gorenstein & Ellsworth, 1980), and whether the culprit is of the same race as the witness (Brigham & Malpass, 1985), among a host of other factors.

Given this state of affairs, perhaps it is not surprising that jurors show little success differentiating accurate eyewitness identifications from erroneous ones (Brigham & Bothwell, 1983; Cutler, Penrod, & Stuve, 1988; Kassin, Rigby, & Castillo, 1991; Leippe, Manion, & Romanczyk, 1992; Lindsay, Wells, & O’Connor, 1989; Wells, Lindsay, & Ferguson, 1979). The genesis of this inability appears to stem from the juror’s reliance on the confidence of the eyewitness. Jurors believe that eyewitnesses are credible to the extent that they render confident decisions (e.g., Leippe, Manion, & Romanczyk, 1992). However, the connection between eyewitness confidence and accuracy has been found to be surprisingly problematic. Many researchers have found little or no relationship between eyewitness confidence and accuracy (Bothwell, Deffenbacher, & Brigham, 1987; V. L. Smith, Kassin, & Ellsworth, 1989; Wells & Murray, 1984). Other researchers have found a modest relationship between eyewitness confidence and accuracy, although that relationship is constrained only to those who make a positive identification of someone out of a lineup. Those who correctly choose the culprit are moderately more confident than those who incriminate an innocent person (Sporer, Penrod, Read, & Cutler, 1995). However witnesses who correctly state that the perpetrator is not present when the culprit is, indeed, not present are not more confident than those who erroneously reach the same judgment when the perpetrator is present (Sporer et al., 1995).

In response to this difficulty of discerning accurate eyewitnesses from erroneous ones, research over the past decade has turned to searching for other indicators that might usefully diagnose eyewitness accuracy. One very promising indicator is the amount of time that it takes an eyewitness to make an identification. Several researchers have consistently found that witnesses who make accurate positive identifications from a lineup (i.e., they correctly identify the culprit) reach their decisions more quickly than witnesses who make mistaken positive identifications of some innocent individual (Dunning & Stern, 1994; Robinson, Johnson, & Herndon, 1997; S. M. Smith, Lindsay, & Pryke, 2000; Sporer, 1992, 1993, 1994). It is important to note that this relationship, like that for confidence, only extends to those positively identifying someone from the lineup. Response time does not discriminate between those who accurately versus inaccurately reject the lineup (i.e., say the culprit is not in the lineup).

Good theoretical reasons exist for why response time should arise as a reliable indicator of accuracy for positive identifications. Eyewitnesses making accurate and inaccurate positive identifica-
tions tend to reach their decisions via different cognitive routes (Dunning & Stern, 1994; Stern & Dunning, 1994). Accurate positive identifications are more likely to be automatic in nature. That is, eyewitnesses correctly identifying the culprit make their identifications quickly, without conscious effort, strategy, or awareness of how they went about the task. After making an identification, they tend to state that the perpetrator’s face just “popped out” at them, or that they had little idea why they knew it was the perpetrator but that they knew it was him. In contrast, witnesses incorrectly choosing an innocent individual display no such problem in describing how they reached their identification. Witnesses making erroneous positive identifications, often not recognizing the perpetrator automatically, tend to pursue a deliberate, time-consuming, and conscious process-of-elimination strategy, narrowing down the choices before them, eliminating the ones they believed were not the culprit, until they make a decision. More often than not, this effortful strategy leads them to the wrong person in the lineup. Besides the data of Dunning and Stern (1994), other researchers have provided data that replicate or are consistent with this automatic versus deliberative distinction (Lindsay & Bellinger, 1999; Perretta & Dunning, 2001; Robinson & Johnson, 1998; Robinson et al., 1997; Wells, 1984).

However, one aspect of the study of response time does present a problem when translating how it should be used in forensic settings. Although researchers have repeatedly documented that accurate positive identifications are made more quickly than inaccurate ones, it is difficult to see how that piece of knowledge should be used in the police station. In the station, the criminal investigator at times may have only one witness who has chosen an individual out of a lineup in, let us say, 20 s. What is the investigator to make of that 20-s figure? Should he or she assume that 20 s is fast, and thus the eyewitness is accurate, or should he or she assume that the 20-s figure is slow, and thus an indicator of error? Research to date offers little explicit guidance. To be sure, it suggests that investigators should give more weight to the decisions of quick witnesses over slow ones when they have a large number of eyewitnesses who disagree over their identifications, but the work to date offers little guidance about how to treat the identifications of individual witnesses with whom there is no one else to compare.

In short, because the work to date has been comparative in nature, measuring the response time of accurate positive identifications against that of inaccurate ones, it is not as useful as it could be to the forensic investigator. A potentially more useful comparison would be to compare the response times of accurate and inaccurate positive identifications against some absolute metric. Along the dimension of time, is there some point at which the investigator can be confident that a witness choosing someone in the lineup is likely to be accurate, or to be inaccurate?

In this article, we describe an analysis aimed at providing information about how fast a positive identification must be to be considered accurate and how slow to be deemed inaccurate. We looked at response time differently from the way it has been looked at in previous research. Instead of comparing the response times of accurate and inaccurate eyewitnesses, we looked at the dimension of response time itself, to see whether there was any point on this dimension that best differentiated accurate from inaccurate positive identifications. More specifically, we investigated whether there was any “time boundary” that best distinguished accurate from inaccurate choices out of a lineup. For example, if we set a boundary at 20 s, were witnesses making positive identifications within 20 s more likely to be accurate than those who took longer? What about a boundary set at 30 s or at 10 s? Which of these time boundaries would do the best job at distinguishing accurate positive identifications from inaccurate ones?

To date, eyewitness research has not examined response times in this way, splitting the dimension of time at specific points to see how well accurate and inaccurate witnesses could be distinguished by whether they fell inside or outside that point. The only study that comes close is S. M. Smith et al. (2000), who divided eyewitnesses into those who made their identifications within 15 s, those who took 16 to 30 s, and those who took longer. They found that witnesses who made positive identifications within 15 s were almost 70% accurate, but those taking longer than 30 s were only 18% accurate.

Thus, in the research to be reported here, we did a much more extensive examination of the relation of time to eyewitness accuracy. Response times from four data sets were subjected to a detailed time-boundary analysis. For each data set, we began by splitting witnesses into those who chose someone out of the lineup within the time boundary of 1 s and those who took longer, and then we examined how well this split differentiated accurate from inaccurate choices. We then did the same analysis after splitting witnesses into those who took 2 s versus longer, then 3 s versus longer, and so on, ultimately looking at boundaries of 40 s and beyond.

For each boundary, we looked to see how well it distinguished accurate positive identifications from erroneous ones. We did so in two ways. First, for each boundary, we constructed a 2 (time boundary: inside vs. outside) × 2 (witness: accurate vs. inaccurate) contingency table and computed the relevant chi-square. We looked to see whether any time boundaries reliably produced bigger chi-squares than did others—showing that dividing witnesses according to that boundary best differentiated them into accurate and inaccurate groups. Second, after constructing the relevant 2 × 2 contingency table, we computed a log odds ratio statistic. This statistic, a descriptive one that can be thought of as a measure of effect size, compares the odds of making an accurate positive identification inside the boundary against the odds of being accurate outside the boundary. As the odds ratio grew, so did the odds of being accurate inside the boundary compared against the odds of accuracy outside it. Again, we looked to see whether any time boundary reliably produced large log odds ratios, indicating that accurate positive identifications were being successfully distinguished from inaccurate ones. It is important to note that because past work indicates that response time differentiates accurate from inaccurate positive identifications, but not correct and incorrect rejections of the lineup, we focused our analyses on positive identifications.

We made no firm predictions about whether a replicable “best” time window would emerge or what that time window would be. Given past work, we did predict that any time window that emerged would likely be a short one, although we were agnostic about whether “short” would mean a window of 5 s, 10 s, or 20 s. We predicted that the time window would be small because of Dunning and Stern’s (1994) notion that accurate eyewitness identification is associated with automatic recognition. For many ac-
curate eyewitnesses, recognition of the offender comes quickly, before inaccurate eyewitnesses have gotten far into the process of elimination that produces the likelihood of erroneous judgments.

Beyond looking for reliable time boundaries that best differentiate accurate from inaccurate witnesses, we had a secondary purpose for conducting this research. The three new studies reported here allowed us to examine whether Dunning and Stern’s (1994) indicators of automatic recognition and process of elimination would again differentiate accurate positive identifications from inaccurate ones. Dunning and Stern found that witnesses who correctly chose the culprit described their decisions as more automatic than counterparts who erroneously incriminated an innocent individual. Inaccurate eyewitnesses were more likely to describe their decision in process-of-elimination terms.

Method

Because the four studies shared similar methodological features and produced similar data, they are each described in this Method section.

Study 1

Overview. Study 1 is actually a reanalysis of data reported in Dunning and Stern (1994). Response time data were collected in Studies 2–4 of Dunning and Stern, and those response times are analyzed here. We describe the general methods used for those three studies here, but a more detailed description of the small variations in methods occurring in each individual study can be found in the original article.

Participants. Participants, or rather witnesses, were 201 Cornell University students drawn from large-lecture courses in psychology, communications, and human development. They received extra credit toward their course grades for participating.

Procedure. Participants were run individually. Upon arriving, the participant was told that the session focused on finding ways to recruit people for careers in preschool education, and that the Psychology Department had shot some video of preschool workers during one of their normal days at a local preschool, with hopes of incorporating some of the footage into a recruitment video. Participants were to watch the footage, for they were to be asked about the quality of the video and its potential impact.

Participants then watched a roughly 3-min video that showed various scenes of preschool teachers interacting with children. At the end of the video, one female preschool teacher goes off to a cafeteria for lunch. While there, she leaves her purse on a table while getting food out of a vending machine. A nearby college-aged man of European heritage, average height, and athletic build looks into the purse, pulls out a wallet, takes the money out of the wallet, looks around, and then quietly walks out of the cafeteria. In all, this scene was approximately 35 s long. Participants watched the video on a 19-in. (48-cm) video monitor.

After viewing this scene, the video was stopped and participants were told that the session, in reality, focused on eyewitness testimony. They were then given a questionnaire that asked their recollection of the many scenes they had seen on the video, save the final scene containing the crime. This questionnaire typically took 5–10 min to complete. After completing the questionnaire, the experimenter explained that he or she would next show participants a photo lineup. They were to view the lineup and make an identification decision, which would be to positively identify one of the photos as the culprit, state that he was not present in the lineup, or state that they could not reach a decision. Participants were further warned that the culprit might not appear in the lineup. It is important to note that in a “think-aloud” procedure, participants were asked to say out loud what you are thinking or doing, what sorts of things are going on in your head” as they viewed the lineup and reached their decision. When they reached a decision, they were told to announce it out loud. They were further told that their comments would be tape-recorded. With that, the experimenter then showed participants a lineup containing five photographs. For 149 of the participants, the culprit was in the lineup. For the remaining 52, he was not. Participants could take as long as they wanted to make their identification.

After participants reached their decision, they were given a follow-up questionnaire that asked them to indicate their decision and their confidence in that decision. Participants were told to indicate their confidence by estimating the likelihood that their decision was correct, from 0% to 100%. Participants next confronted measures asking them to describe their decision process as they made an identification. First, they were shown five items and asked to endorse which described how they had reached their decision. Two of the items indicated automatic processing: “I just recognized him, I cannot explain why” and “His face just ‘popped out’ at me.” Three items indicated a process of elimination: “I compared the photos to each other in order to narrow the choices,” “I first eliminated the ones definitely not him, then chose among the rest,” and “He was the closest person to what I remember, but not exact.” Participants could check as many of these five items, or none, as they wished.

Participants also confronted supplemental measures concerning their decision processes. First, they were asked what impact the other photos had had on their decision. Responses they could endorse were “They helped me to confirm, reinforce my decision after I made it,” “They had little influence on my decision,” “They confused me; they made the task more difficult,” and “We were all so similar that they made me less confident.”

Participants could endorse as many of these items as they wished. Finally, participants were asked which had a greater impact on their decision: their memory, the photos, or neither. Participants could choose only one of these response options. After completing this questionnaire, participants were told which photograph (if any) was the one of the culprit. The experimenter then handed them a debriefing form. This debriefing procedure ensured that the experimenters remained unaware of any hypotheses under study.

The three studies from Dunning and Stern (1994) covered under the umbrella of Study 1 each differed from the others in minor ways. One (Study 2 from the original article) presented participants with only culprit-present lineups. One other (Study 3) also presented participants with only culprit-present lineups but manipulated whether participants were to positively identify a photograph regardless of how confident they were or whether they had to be “70% confident” to identify someone. The final study (Study 4) did not manipulate how confident participants had to be before reaching an identification, but it did manipulate whether participants were presented with culprit-present or culprit-absent lineups.

Response times were coded by having a judge hand-time each participant from audiotaped recordings of his or her identification. The cue to begin the timing was a loud noise caused when experimenters (as instructed) vigorously slapped the poster board containing the lineup against the chair in front of participants. The judge ended the timing at the instant the participant finished the sentence that indicated his or her identification judgment (e.g., “I think it’s number 4”). If participants later changed their mind, their identification was not considered complete until they made an identification that they did not later change.

Study 2

Overview. Study 2 is an unpublished and “failed” follow-up to the work completed by Dunning and Stern (1994). In this study, we examined whether forcing participants to reach their identification decision automatically would make them achieve higher rates of accuracy or would at least help them to avoid making positive identifications of the wrong photograph. We tried to force participants to rely more on automatic processes by giving them a second task that should have interfered with their ability to engage in conscious thought while they viewed the lineup. In line with work on “cognitive busyness” (Gilbert, 1989; Gilbert, Pelham, & Krull, 1988), that task was to rehearse and remember a 9-digit number while they viewed the lineup photographs. We should note that this procedure did not
influence accuracy and error rates in any way, although other work has shown that making participants consciously think through their decision damages their accuracy rates (Perretta & Dunning, 2001).

Although this study failed in its original purpose, we resurrected the data set to examine the response time issues at focus in the present article. Thus, although this study was not designed with a response time analysis in mind, it is appropriate for such an analysis.

Participants. Participants were 96 Cornell University students drawn from large-lecture courses in psychology, communications, and human development. They received extra credit toward their course grades for participating.

Procedure. The procedure of this study was largely identical to the one described for Study 1. The same instructions, video, photo lineup, and dependent measures were used, save two important changes. First, there was no think-aloud procedure, although participants were told that the session was being tape-recorded. Second, roughly half of the participants were made “cognitively busy” before they were shown the lineup. They were given a 9-digit number to rehearse while they viewed the lineup. The experimenter impressed upon them the importance of successfully recalling the number after they had made an eyewitness decision and cautioned them against forgetting about the number as they viewed the lineup. The remaining participants were not made cognitively busy. Instead, they were told that they would have to remember a 2-digit number after they had made an eyewitness judgment. This cognitive busyness manipulation had no effect on eyewitness accuracy or behavior, save one. Busy participants took significantly less time to make positive identifications of someone in the lineup (M = 10.4 s), whether accurate or inaccurate, than did nonbusy participants (M = 14.1 s), t(66) = −2.32, p < .05, d = .48. Thus, this variable received no further mention.

All participants viewed culprit-present lineups. The instructions given to the judge coding reaction times were exactly the same as they were for Study 1.

Study 3

Overview. Study 3 was conducted expressly for the response time analyses presented in this article. Students in a large-lecture class were exposed to an in-class “crime.” Some of them then volunteered to attempt to identify the culprit out of a photo lineup.

Participants. Participants were 41 Cornell University undergraduates drawn from a large-lecture psychology course. They received extra credit toward their course grades for participating.

Procedure. The “crime” incident took place roughly 40 min into a 50-min lecture. The culprit, a medium height European-American, college-aged man of athletic build, raised his hand and was called on by the professor, a middle-aged man of medium size and build. The culprit asked when a written assignment for the course would be handed back, and the instructor stated that he never announced when assignments would be handed back. The culprit began to complain loudly and then started to protest about how long it took the instructor to hand anything back. At that, a tall, lanky European-American man of college age ran down to the front of the class and announced that the incident had been staged. As before, a judge hand-timed the reaction time of each participant according to the procedure used in Studies 1 and 2. However, the cue to begin the timing was changed. The judge began the timing as the experimenter ended saying the sentence “Okay, here’s the lineup.”

Experimenters were instructed to end that sentence the exact instant all photographs were visible as they had quickly removed a large sheet of paper covering the six-photo lineup.

Study 4

Overview. Study 4 was another classroom-incident study conducted expressly for the analysis reported in this article. A different classroom and perpetrator were used.

Participants. Participants were 50 Cornell University undergraduates enrolled in a large-lecture introductory class on human development. They received extra credit toward their course grades for participating.

Procedure. The incident occurred roughly 40 min into a 50-min lecture. At one point, the instructor, a petite woman, asked the class if anyone had any questions. A voice boomed loudly from the back that he did. At that, a tall, lanky European-American man of college age ran down to the stage with a large poster board sign reading “Animal Dissection: Cut It Out!” and began to protest the use of animals in research. After about 20 s, the instructor tried to grab the sign away from the culprit, but he moved over to the side of the stage where his face was lit by the glare of an overhead projector. The instructor motioned to two burly male teaching assistants to apprehend the culprit, at which point he threw the sign into the air and ran out the back of the room. In all, he was visible to class members for about 1 min.

As soon as the culprit had run out of the room, a researcher walked to the front of the class and announced that the incident had been staged. As in Study 3, the researcher stated that the incident was connected to an ongoing experiment and that students could sign up to attempt to identify the culprit out of a lineup, if they had not placed their names already on sign-up sheets that had been posted in the back of the room. In all, the culprit was visible to members of the class for roughly 2.5 min.

Once arriving at the identification, participants were run individually the day of the incident or the day after. They were told that they would view a lineup that may or may not contain a photograph of the culprit. They then viewed the photo lineup containing six photographs while their reactions were recorded. After reaching a decision, which they announced to the experimenter out loud, they filled out the same confidence and decision process measures described above.

Participants were assigned at random to view either a culprit-present or culprit-absent lineup, although the assignment was arranged so that a ratio of 3 to 2 participants would view the culprit-present lineup over the culprit-absent one. The lineup was constructed by having a research assistant view the culprit and then collect roughly 20 additional photographs of individuals she thought looked similar to the culprit. All photographs were head-and-shoulder shots taken against a white background. After the set of photographs were collected, members of the research team together selected the 6 photographs that looked most similar to the culprit, with 5 of those photographs used in the culprit-present lineup and all 6 used in the culprit-absent one.

As before, a judge hand-timed the reaction time of each participant according to the procedure used in Studies 1 and 2. However, the cue to begin the timing was changed. The judge began the timing as the experimenter ended saying the sentence “Okay, here’s the lineup.”

Experimenters were instructed to end that sentence the exact instant all photographs were visible as they had quickly removed a large sheet of paper covering the six-photo lineup.

Finally, to assess the reliability of our reaction time coding procedure, a second judge coded the reaction times of participants in Studies 3 and 4. The reaction times produced by this second judge in each study correlated
in excess of .995 with the reaction times used in the analyses reported in this article and would produce no differences in our conclusions if these reaction times replaced the ones used in our analyses.

Results

Witness Decisions

Table 1 displays the number of witnesses in each study who accurately identified the culprit, mistakenly identified someone else, rejected the lineup (that is, said that the culprit was not present in the lineup), or reached no firm decision. Across the studies, 147 witnesses accurately identified the culprit and 116 mistakenly identified someone else. Of these 116 false identifications, 68 misidentified someone when the culprit was actually in the lineup and 48 misidentified someone when the culprit was not. For all analyses discussed below, we compared the responses of accurate witnesses with those making misidentifications, regardless of whether misidentifiers faced culprit-present or culprit-absent lineups. Supplemental analyses revealed that there were no discernible differences between culprit-present and culprit-absent mis identifiers, and thus this distinction is discussed no further.

Response Time

Replicating past work, we found that witnesses making accurate positive identifications were faster than those making erroneous ones. Table 2 displays the mean raw reaction times for witnesses making accurate and inaccurate positive identifications across the four studies. Because reaction times were positively skewed, we subjected those times to logarithmic transformations before conducting any statistical comparisons. In each study, accurate positive identifications were made more quickly than inaccurate ones (all ps < .05), and across studies the difference between accuracy and inaccuracy was quite striking. The difference between accurate and inaccurate positive identifications has already been reported for Study 1 (see Dunning & Stern, 1994). Across the three new studies reported here, the statistical significance of the reaction time difference was impressive (Z = −4.27, p < .01, d = .98).

An inspection of Table 2 reveals one notable difference among the four studies. Reaction times for Study 1 were markedly slower than they were for the other three studies. We presume that this difference arose because Study 1 participants were engaged in think-aloud procedures as they made their identifications, whereas participants in the other three studies did not. Although it is intuitive that describing what is going on in one’s mind as one reaches a decision would slow the decision process down, what is particularly striking is how much that process was slowed down by this procedure.

Time-Boundary Analysis

Having established the usual reaction time difference between accurate and inaccurate positive identifications, we moved to a “time-boundary” analysis in which we explored whether there were any specific time boundaries that best differentiated accurate witnesses from inaccurate ones. Thus, for each study separately, we first split witnesses into those who had made a positive identification within 1 s and those who had taken longer. Then we performed the same split at 2 s, then 3 s, then 4 s, and so on. For each time-boundary split, we counted the number of accurate and inaccurate witnesses who fell inside the boundary as well as accurate and inaccurate witnesses outside the boundary. Then, for each split, we computed a chi-square statistic based on the 2 × 2 contingency table produced by that split. Larger chi-squares indicate that the time boundary defining the boundary differentiated between accurate and inaccurate positive identifications to a greater degree. Thus, we looked to see where these chi-squares “peaked,” to see whether the time boundaries that showed the greatest differentiation between accurate and inaccurate positive identifications tended to fall at roughly the same place.

Table 3 displays the results of this time-boundary analysis for the four studies. Inspection of the table reveals some informative consistencies across the studies for where the chi-squares peaked,
Table 3
Chi-Squares Resulting From Time-Boundary Analysis
for 1 to 40 s

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<td>30</td>
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<td>2.23</td>
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<tr>
<td>31</td>
<td>3.15</td>
<td>0.50</td>
<td>4.73</td>
<td>8.58</td>
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<tr>
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<td>0.50</td>
<td>4.73</td>
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<tr>
<td>33</td>
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<td>0.50</td>
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</tr>
<tr>
<td>40</td>
<td>1.48</td>
<td>0.39</td>
<td>1.04</td>
<td>6.04</td>
</tr>
</tbody>
</table>

Note. Numbers in bold represent the “peaks of differentiation” discussed in the text. Chi-squares were not computed until the first witnesses made an identification.

and thus the best differentiation between accurate and inaccurate positive identifications. Specifically, all studies showed strong initial peaks taking places roughly between 10 and 12 s. Study 1 shows a chi-square peak at 12 s, Study 2 at 10 s, Study 3 in the interval between 8 and 10 s, and Study 4 at 11 s. Other secondary peaks emerge at greater time intervals, but those secondary peaks do not align across the four studies consistently. Study 1 shows a secondary peak at 25 s, Study 2 at 16 s, Study 3 around 16 s and again at 31 s, and Study 4 around 25 to 27 s.

In short, all studies show strong and observable chi-square peaks at around 10 to 12 s, meaning that accurate positive identifications could be best differentiated from inaccurate ones by assessing whether the identification was made within 10 to 12 s. To be sure, other places on the time line might also appear to do a good job of differentiating accurate from inaccurate witnesses. For example, two studies showed a peak of differentiation around 16 to 17 s, and two showed similar peaks around 25 s, but those peaks are not as large, nor are they as consistent. The clearest way to show this is via Figure 1, which shows the combined average of the chi-square statistics computed across the four studies (weighted by number of witnesses in each study). As seen in the figure, the amount of differentiation occurring at 10 to 12 s is much stronger than it is anywhere else, with the average chi-square hovering just under 8 (maximum chi-square of 7.92 occurs at the 11-s boundary). Smaller peaks occur at 16 s and at 25 s (both peaks are roughly around 6.6). Computing unweighted averages did not substantively alter any conclusions reached in this article.

To affirm the observation that accurate and inaccurate positive identifications are best differentiated by whether they are made within 10 to 12 s, we did a supplemental analysis. This analysis was similar to the chi-square analysis reported above, except that for each time boundary, we computed a log odds ratio instead of a chi-square.

Thus, for each time boundary (e.g., 0 to 1 s, 0 to 2 s, etc.), we calculated the log odds ratio, comparing the odds that a witness was accurate when his or her positive identification fell inside the boundary with the odds that the witness was accurate when his or her identification fell outside the boundary. However, calculating odds ratios proved difficult for extremely small or extremely large time boundaries, because at times the number of accurate or inaccurate witnesses inside or outside the boundary fell to 0, and odds ratios could not be calculated when those numbers fell to 0. Thus, in those instances, we added 0.5 to the number of cases used to calculate the odds ratio.

Table 4 displays the results of this boundary analysis for the four studies. Again, there is some consistency in that the statistic peaks at around 10 to 11 s across the four studies, with some more minor peaks arising later on. Study 1 shows a quick peak at 4 s and another peak again at 10 s. Study 2 shows a peak at 10 s and another one at around 21 to 25 s. Study 3 shows a peak at 8 to 10 s and another one at roughly 31 to 32 s. Study 4 shows a strong peak at 11 s and another strong one around 25 to 27 s.

The importance of the 10- to 12-s time boundary is best revealed when we average the results of this log odds ratio analysis across the four studies. Figure 2 displays the average log odds ratio analysis...
computed for each time boundary across the four studies (weighted by number of witnesses in each study). As seen in the figure, the average log odds ratio climbs to a high peak at 10 s (average log odds ratio = 1.92), with minor peaks evident at 16 s (1.44) and 25 s (1.52).

**Why 10–12 s?**

What caused our measures of differentiation to peak at 10 to 12 s? One additional analysis provides a clear answer. For each study, we split witnesses into those who reached their identifications at 0 to 10 s, 11 to 20 s, 21 to 30 s, and 31 to 40 s, ignoring those who took longer. Figure 3 displays the accuracy rates of witnesses making positive identifications within each time interval. As is evident in the figure, witnesses who made their identifications within 10 s tended to be largely accurate, with an average accuracy rate across the four studies of 87.1%. Accuracy rates dove soon after that. The average accuracy rate of those making positive identifications within 11 to 20 s was only 52.5%, 51.4% for those taking 21 to 30 s, and 40.7% for those taking 31 to 40 s.

Upon reflection, this analysis suggests that the time-boundary analysis identified a period of time in which many accurate witnesses making positive identifications reveal their choice but in which few witnesses making erroneous positive identifications do likewise. Across the four studies, 54 witnesses who made positive identifications (and nearly 37% of all the accurate witnesses for whom we have data) made their choices within 10 s, but only 8 witnesses making incorrect positive identifications (or under 7% of all inaccurate witnesses we observed) did likewise. Beyond that 10-s boundary, accuracy rates fell quickly to roughly 50%—a witness was just as likely to be wrong as he or she was to be right when picking a person out of the lineup.

Further analysis explored what occurred at more minor peaks discovered in our time-boundary analysis. One minor peak occurred at 16 s. This result seemed to arise because the percentage...
of witnesses making accurate positive identifications within this boundary (75.9%) diverged somewhat from the percentage outside the boundary making accurate positive identifications (42.8%). These two percentages converge somewhat until a time boundary of 25 s, when again the percentage of witnesses making accurate positive identifications inside the boundary (69.4%) diverged from the percentage of witnesses who were accurate outside the boundary (39.5%). However, beyond these mild divergences, splitting witnesses according to whether they fell into a 16- or 25-s boundary did nothing to diagnose whether they were accurate or inaccurate.

One final analysis, inspired by the 10 to 12 s result, was pursued. The 10-s boundary differentiated accurate from inaccurate positive identifications because almost every witness falling into this short time window was an accurate one. Might a symmetric result occur at the other side of the response time distribution? At very long time intervals, might time windows exist in which almost everyone falling outside the window makes inaccurate positive identifications? That is, if one worked backward from long time windows, might one find a boundary beyond which almost all witnesses are inaccurate and almost none accurate when they chose someone out of the lineup? To explore this issue, we started with the witness taking the longest time to make a positive identification in each study and worked backward, looking to see if there was some time boundary beyond which almost all witnesses were inaccurate in their positive identifications. More specifically, we examined whether we could find a time boundary in which 85% of the witnesses falling on the high side of the boundary would be inaccurate. The 85% figure was chosen because it was comparable to the percentage of witnesses who were accurate within the short 10-s time boundary.

Unfortunately, our search for a consistent time boundary beyond which witnesses made largely inaccurate choices was a failure. For two studies (Studies 1 and 2), we never found a boundary beyond which witnesses were 85% inaccurate. Such boundaries were found for Studies 3 and 4, but they fell in different places. The boundary for Study 3 fell at 30 s, and for Study 4 at 21 s.

Confidence

We also explored more traditional indicators of accuracy and error in eyewitness identification. Table 5 displays the average confidence expressed by witnesses making accurate and inaccurate positive identifications across the four studies. Witnesses making positive identifications were significantly more confident than those making inaccurate ones in Study 1 (as reported in Dunning & Stern, 1994), and the same trend emerged in the three new studies reported here, although that trend was nonsignificant in each of these new studies (ps > .16). However, when the data across the three studies were combined meta-analytically, a significant difference between witnesses making accurate and inaccurate positive identifications emerged (Z = 2.05, p < .05), albeit only a moderate one (d = .43).

Reports of Decision Processes

We also examined whether we replicated, in the three new studies reported here, Dunning and Stern’s (1994) finding that witnesses making accurate positive identifications are more likely, relative to their erroneous counterparts, to describe their decisions processes as an automatic process and not one involving process of elimination. Recall that, after Dunning and Stern, we asked witnesses making positive identifications to describe their decision processes by endorsing up to five different descriptions of the experience. Two of the options indicated automatic processing and three indicated process of elimination. For each witness making positive identifications, we totaled the number of automatic processing items endorsed as well as the number of process-of-elimination items endorsed. Then, for each study, we performed a 2 (witness: accurate vs. inaccurate) × 2 (item type: automatic processing vs. process of elimination) mixed-model analysis of variance (ANOVA), with the last variable serving as a withinsubject variable. We predicted to find Witness Accuracy × Item Type interactions, with witnesses making accurate identifications endorsing more automatic items and fewer process-of-elimination items than their inaccurate peers, and that is what we found. As seen in Table 6, this interaction was significant in two of the studies and marginally significant in the third. Across the three studies, the interaction was highly significant (Z = 3.04, p < .01, η = .31).1

In addition, across the three new studies, differences emerged between witnesses making accurate and inaccurate positive identifications on supplemental measures that Dunning and Stern (1994) included in their study. Table 7 displays the percentage of witnesses making accurate and inaccurate positive identifications who endorsed these supplemental descriptions of their experience across Studies 2–4. When asked about the influence of the other photographs on their decision, accurate witnesses were more likely than their inaccurate counterparts to state that the other photographs had merely “confirmed” or “reinforced” their decision or had had little impact on their decision (ps < .05). Inaccurate witnesses were more likely to state that the other photographs “confused” them and made the task more difficult and that “they were all so similar that they made me less confident” (ps < .05). When asked whether their memory or the pictures had had a greater impact on their decision, accurate witnesses cited their memory more often than did inaccurate witnesses, who in contrast

Table 5

Confidence of Witnesses Making Accurate Versus Inaccurate Positive Identifications

<table>
<thead>
<tr>
<th>Study</th>
<th>Witness type</th>
<th>t</th>
<th>df</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Accurate</td>
<td>Inaccurate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>78.3</td>
<td>59.7</td>
<td>5.33**</td>
<td>135</td>
</tr>
<tr>
<td>2</td>
<td>70.3</td>
<td>71.2</td>
<td>1.37</td>
<td>66</td>
</tr>
<tr>
<td>3</td>
<td>80.0</td>
<td>69.2</td>
<td>1.43</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>78.6</td>
<td>71.2</td>
<td>1.18</td>
<td>26</td>
</tr>
</tbody>
</table>

** p < .01.

1 These analyses omit an outlier in Study 4 whose interaction term (number of automatic processing items endorsed minus process of elimination items endorsed) lies 3 SD away from the relevant group mean and more than 1 SD from its nearest neighbor. When this outlier is included in the 2 × 2 ANOVA, the F in Study 4 falls to 2.29. The overall result across the studies stays quite strong (Z = 2.82, p < .005, η = .28).
were more likely to state that the pictures had a greater impact \((p < .05)\).

**Nonidentifications**

In a final set of analyses, we examined whether confidence or response time predicted accurate versus inaccurate lineup rejections. For example, were witnesses who accurately rejected a culprit-absent lineup more confident than those who erroneously rejected a culprit-present lineup? Combined data from the three studies (Studies 1, 3, and 4) for which we have data on nonidentifications suggested that the answer is no. Witnesses accurately rejecting a lineup without the culprit were no more confident \((M = 73.7)\) than were witnesses wrongly rejecting a lineup with the culprit \((M = 71.1; Z < 1, ns, d = .12)\). Examining response times also revealed no significant differences between witnesses accurately rejecting culprit-absent lineups \((M = 48.6 \text{ s})\) and those incorrectly rejecting culprit-present ones \((M = 53.8 \text{ s}; Z < 1, ns, d = .22)\).

**General Discussion**

We began this article by noting an emerging literature that portrays response time as a reliable indicator of eyewitness accuracy and error, at least among those who positively identify someone out of a lineup (Dunning & Stern, 1994; Robinson et al., 1997; S. M. Smith et al., 2000; Sporer, 1992, 1993, 1994). Our data reaffirmed this conclusion. Across the three studies providing new data, witnesses who accurately identified the culprit were significantly faster to reach their decision than were their peers who incorrectly chose another individual.

Nevertheless, we noted the limited forensic value of this observation. It is difficult to tell from past research how fast witnesses must be to indicate that their positive identifications are accurate ones and how slow they must be to be deemed inaccurate. Thus, across four data sets, we examined whether there was a time boundary that best differentiated accurate positive identifications from inaccurate ones. We found that a time limit of roughly 10 to 12 s did the best and most consistent job of separating accurate from inaccurate positive identifications. Whether the metric of differentiation was a chi-square or a log odds ratio, witnesses were best sorted into accurate and inaccurate groups by examining whether they made their identifications within this 10- to 12-s boundary. Supplemental analyses revealed why this 10- to 12-s boundary worked so well and also specified the conclusions investigators could potentially reach about witnesses falling inside versus outside the window. Witnesses who chose someone out of the lineup quickly (e.g., within 10 s) were overwhelmingly accurate-reaching accuracy rates near 90%. Outside the window, rates of accuracy fell quickly to roughly 50%.

**Table 6**

*Average Number of Automatic Processing and Process-of-Elimination Responses Endorsed by Witnesses Making Accurate Versus Inaccurate Positive Identifications*

<table>
<thead>
<tr>
<th>Witness type</th>
<th>Automatic processing</th>
<th>Process of elimination</th>
<th>F(interaction)</th>
<th>df</th>
<th>η</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>.5</td>
<td>1.0</td>
<td>.4</td>
<td>1.5</td>
<td>3.55</td>
</tr>
<tr>
<td>3</td>
<td>.5</td>
<td>0.9</td>
<td>.3</td>
<td>1.7</td>
<td>4.54*</td>
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<tr>
<td>4</td>
<td>.6</td>
<td>0.6</td>
<td>.3</td>
<td>1.3</td>
<td>4.92*</td>
</tr>
</tbody>
</table>

* \(p < .05\).*

**Table 7**

*Proportion of Supplemental Decision Process Descriptors Endorsed by Witnesses Making Accurate Versus Inaccurate Positive Identifications*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Witness type</th>
<th>Accurate</th>
<th>Inaccurate</th>
<th>Z</th>
<th>(\phi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact of other photos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“They helped me to confirm, reinforce my decision after I made it.”</td>
<td></td>
<td>.71</td>
<td>.51</td>
<td>2.27*</td>
<td>.21</td>
</tr>
<tr>
<td>“They had little influence on my decision.”</td>
<td></td>
<td>.29</td>
<td>.08</td>
<td>2.76**</td>
<td>.25</td>
</tr>
<tr>
<td>“They confused me; they made the task more difficult.”</td>
<td></td>
<td>.07</td>
<td>.31</td>
<td>-3.48**</td>
<td>-.32</td>
</tr>
<tr>
<td>“They were all so similar that they made me less confident.”</td>
<td></td>
<td>.10</td>
<td>.27</td>
<td>-2.48*</td>
<td>-.22</td>
</tr>
<tr>
<td>Which had a greater influence on the decision?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td></td>
<td>.62</td>
<td>.41</td>
<td>2.26*</td>
<td>.20</td>
</tr>
<tr>
<td>The pictures</td>
<td></td>
<td>.10</td>
<td>.22</td>
<td>-1.96*</td>
<td>-.18</td>
</tr>
<tr>
<td>They had about equal impact</td>
<td></td>
<td>.29</td>
<td>.37</td>
<td>0.86</td>
<td>.07</td>
</tr>
</tbody>
</table>

* \(p < .05\). ** \(p < .01\).
With this in mind, we must warn against one way to misinterpret our result that a time boundary of around 10 to 12 s best differentiates accurate from inaccurate positive identifications. Although it is clear that witnesses making positive identifications within 10 s were right almost 9 times out of 10, one should not conclude that witnesses making positive identifications outside this window were largely inaccurate. Of witnesses making positive identifications outside the 10-s boundary, 46.3% made accurate identifications. Indeed, we could find no reliable time frame in which witnesses tended to be consistently inaccurate. Thus, the conclusion that we believe is appropriate from our data is that witnesses making positive identifications within 10 to 12 s are likely to be correct. If witnesses take longer, it is unclear whether they are accurate or inaccurate. Furthermore, this conclusion applies to positive identifications of an individual out of a lineup only. Replicating past work (Sporer, 1994), response time did not differentiate between people accurately or erroneously rejecting a lineup.

Across the four studies we conducted, we found consistent peaks of differentiation somewhere between 10 and 12 s. We think this finding is impressive given that the four studies each contained idiosyncrasies that influenced other eyewitness behavior. In Study 1, participants followed a think-aloud procedure that slowed down both accurate and inaccurate witnesses dramatically, roughly tripling the amount of time it took them to reach an identification. In Study 2, half of the participants completed a distracting task while they viewed the lineup, a procedure that slightly speeded their decisions. In addition, across the four studies, three different perpetrators and lineups were used. Yet, across all these variations, the strongest peak of differentiation appeared somewhere between 10 and 12 s, depending on the study and the measure of differentiation used.

The presence of this consistent peak of differentiation fits well with the automatic recognition versus process-of-elimination distinction proposed by Dunning and Stern (1994). If a significant plurality of accurate witnesses make their identifications through an automatic cognitive process, that process should not be influenced heavily by external circumstances. Indeed, one of the hallmarks of an automatic process is that it arises in the same way despite how the situation surrounding it changes (Hay, Young, & others, 1987; Deffenbacher, 1980), lending credence to the notion that optimality might influence the relationship between response time and eyewitness accuracy.

Second, we should stress that although we found a correlation between speed of identification and the accuracy of that identification, this does not imply that there is a causal connection between the two. More tellingly, one should not conclude that one could increase eyewitness accuracy by forcing witnesses to make their identifications within 10 to 12 s. We have tried this and have found we create no impact on eyewitness accuracy (Perretta, 1998). This is true even though eyewitness accuracy is significantly damaged by forcing eyewitnesses to consciously and carefully deliberate over their decision (Perretta & Dunning, 2001).

Finally, we should note that the new data presented in this article largely replicated the work of Dunning and Stern (1994). Asking witnesses to describe the decision processes that led to their positive identifications significantly predicted the accuracy of their choices. In some sense, the findings of Study 2 should not have been surprising because this study used the same crime scenario, procedure, and lineup as the studies in Dunning and Stern. However, Studies 3 and 4 both included new incidents, procedures, perpetrators, and lineups, yet the same decision process measures significantly differentiated accurate from inaccurate positive identifications.

More specifically, when witnesses were asked to describe how they had reached their decisions, witnesses making accurate positive identifications were more likely to describe their decisions as automatic and less likely as a process of elimination than were those choosing incorrectly. Inaccurate witnesses displayed the
Bothwell, R. K., Deffenbacher, K. A., & Brigham, J. C. (1987). Correlation provide forensic investigators with useful information to be used in that other indicators of eyewitness accuracy might be analyzed to lineup. As well, we hope that this research provides another way at least among those positively identifying someone out of a used to sort eyewitnesses into accurate and inaccurate categories, witnesses from inaccurate ones. We hope that this article has eyewitness researchers is finding ways of differentiating accurate the identification attempt, and the interim in-between. That said, influenced and damaged by circumstances surrounding the crime, Eyewitness accuracy is a delicate and brittle phenomenon, easily witnessed can be accurate, and so one key question facing eyewitness researchers is finding ways of differentiating accurate witnesses from inaccurate ones. We hope that this article has presented convincing evidence of one way response time can be to sort eyewitnesses into accurate and inaccurate categories, at least among those positively identifying someone out of a lineup. As well, we hope that this research provides another way that other indicators of eyewitness accuracy might be analyzed to provide forensic investigators with useful information to be used in the police station and the courtroom.

Concluding Remarks

Eyewitness accuracy is a delicate and brittle phenomenon, easily influenced and damaged by circumstances surrounding the crime, the identification attempt, and the interim in-between. That said, eyewitnesses can be accurate, and so one key question facing eyewitness researchers is finding ways of differentiating accurate witnesses from inaccurate ones. We hope that this article has presented convincing evidence of one way response time can be used to sort eyewitnesses into accurate and inaccurate categories, at least among those positively identifying someone out of a lineup. As well, we hope that this research provides another way that other indicators of eyewitness accuracy might be analyzed to provide forensic investigators with useful information to be used in the police station and the courtroom.

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