Investigating Investigators: How Presentation Order Influences Participant–Investigators' Interpretations of Eyewitness Identification and Alibi Evidence

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Abstract Presentation order of ID and Alibi evidence was manipulated for undergraduate participants who conducted a simulated police investigation. Experiment 1 found a recency effect when an eyewitness rejected the investigator's suspect. Experiment 2 also examined order effects, exploring how participant–investigators evaluated alibi information in addition to eyewitness ID information. When investigators saw the witness identify the suspect but also received a strong alibi for that suspect a recency effect occurred, such that whichever piece of information occurred at the end of the procedure had the strongest impact on investigators. Thus, type of evidence and evidence order both had a dramatic influence on participant–investigators' decisions.

Keywords Police investigations · Alibis · Eyewitness identifications · Recency effects

Police investigators play a central role in the drama that is our justice system; in fact, their role in the justice system might be compared to a physician's role in the medical system. Police and doctors examine the evidence that is available, search out other clues that are not immediately apparent, and make decisions based on the gathered evidence. Research has examined these decision-making processes with medical doctors and has found that physicians are susceptible to a variety of decision-making biases such as confirmation bias, influence of irrelevant anchors,

the representativeness heuristic, and insensitivity to base rates (for review, see Chapman & Elstein, 2000). Interestingly, level of physician expertise often has little or no impact on such biases (e.g., Cunnington, Turnbull, Regehr, Marriott, & Norman, 1997; Wallsten, 1981).

Of particular interest here are several studies that have found that medical doctors' diagnoses can be biased by the order in which different pieces of information are encountered. Specifically, diagnostic clues uncovered later in the course of the diagnostic process tend to be given more weight (e.g., Bergus, Chapman, Gjerde, & Elstein, 1995; Cunnington et al., 1997; Elstein & Schwarz, 2002). Here again, level of physician expertise appears to be unrelated to susceptibility to this order effect.

We examined potential order effects in a simulated police investigation, in which participant–investigators were required to interpret multiple sources of evidence (e.g., eyewitness and alibi) that were encountered at varying points during the investigation and made decisions regarding the likely guilt of a suspect. We also compared the influence of different ID decisions (ID suspect vs. Not Present) and of strong (exonerating) versus weak (inculpating) alibis on participant–investigators' estimates of the probability that their suspect was guilty.

The immense impact of eyewitness identifications in criminal proceedings has been demonstrated through decades of psychological research. Research with mock jurors has consistently found that eyewitness identifications provide strong evidence for the guilt of a defendant (e.g., Cutler, Penrod, & Stuve, 1988; Levett, Danielsen, Kovera, & Cutler, 2005; Wells, Lindsay, & Ferguson, 1979). In fact, despite the documented small correlation between accuracy and confidence (e.g., Bothwell, Deffenbacher, & Brigham, 1987; Busey, Tunnicliff, Loftus, & Loftus, 2000; Penrod & Cutler, 1995), in a study conducted by Cutler,

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Penrod, and Dexter (1990), witness confidence was found to be the only variable that reliably influenced juror judgments. Van Wallendael, Cutler, Devenport, and Penrod (2007) argued that attorneys and judges are also likely to be unduly swayed by eyewitness ID evidence.

In contrast to the wealth of studies of mock jurors, very little research has examined the impact of eyewitness identification evidence on those in the role of police investigators (e.g., Boyce, Lindsay, & Brimacombe, in press; Lindsay, Nilsen, & Read, 2000; Dahl, Lindsay, & Brimacombe, 2006). Investigators must weigh eyewitnesses' identification decisions to determine whether they are sufficiently credible and reliable to warrant pursuing (or exonerating) the suspect. Therefore, it is important to understand how those in the role of investigator evaluate eyewitness decisions. Findings regarding mock jurors' perceptions of eyewitnesses may not generalize to investigators because jurors and investigators differ in numerous ways. For example, investigators see witnesses make their initial identification decisions, often within hours or days of the crime, before extensive rehearsal, feedback, coaching, and other confidence-inflating factors occur. Also, investigators actively interact with witnesses, rather than passively viewing them testifying. Finally, investigators must deal with witnesses who identify innocent foil lineup members and rejections of lineups as well; jurors are unlikely to be made aware of these decisions within a case.

In addition, involvement in the investigation likely leads police investigators to become personally invested in the case, wanting to catch the culprit and to have enough evidence to ensure that the culprit is punished and prevented from committing additional crimes. This personal investment has not been simulated in prior research and is unlikely to occur for participants in the roles of mock jurors, as they do not interpret the evidence in regard to the accuracy of their own decision-making the way police officers might do.

Dahl et al. (2006) set out to examine how undergraduate students role-playing police investigators integrate eyewitness identification decisions into their knowledge of other evidence against the suspect using a simulated investigation paradigm. The participants individually interviewed a confederate witness about a videotaped crime, went through a computer database of potential suspects, selected a suspect, and estimated the probability that the suspect was guilty. The participant–investigators then administered a photo lineup to the witness, and re-estimated the suspect's guilt.

Using this simulated investigation paradigm, Dahl et al. (2006) found that participant–investigators overwhelmingly overestimated the informativeness and credibility of an eyewitness's decision. If the witness identified the suspect, probability estimates regarding the likely guilt of the suspect increased dramatically. If the witness identified a known innocent lineup member or rejected the lineup, investigators' probability estimates plummeted, even when pre-lineup objective evidence (e.g., fingerprints) was strong. Dahl et al. (2006) subsequently examined participants in the role of eyewitnesses using the materials that the investigator studies were based on and found that these eyewitnesses performed at chance. Therefore, had the investigators been working with real participant-witnesses they likely would have been highly influenced by an incorrect decision, and indeed, that is exactly what Boyce et al. (in press) found using real witnesses in studies extending those of Dahl et al. (2006).

One possible explanation for the impact of the eyewitness decision in Dahl et al. (2006) and Boyce et al. (in press) studies is that it is due to the timing of the presentation of the eyewitness decision. The eyewitness identification decision was always at the very end of the procedure after all other evidence had been presented. Therefore, the strength of the eyewitness decision may have been overemphasized because it was the last piece of the puzzle that either confirmed the investigators' beliefs or put them back at square one. As such, a recency effect (when recently encountered stimuli are more salient than earlier presented material) might be blamed for the large influence the eyewitness decision had on investigators.

Although the examination of recency effects has been ongoing since the 1960s (e.g., Adelman, Tolcott, & Bresnick, 1993; Baddeley, 1963; Bjork & Whitten, 1974; Rundus, 1971; Waugh & Norman, 1965), there has been no research (to our knowledge) of the impact of presentation order within police investigations. However, there has been research examining presentation order effects in jury decision-making (e.g., Constabile & Klein, 2005; Davis, Tindale, Nagao, Hinsz, & Robertson, 1984; Wallace & Wilson, 1969; Wilson, 1971). Many of these studies have found recency effects. For example, both Furnham (1986) and Carlson and Russo (2001) found that when prosecution evidence was presented after defense arguments, participants were significantly more likely to render a guilty verdict than when the defense arguments were presented after the prosecution arguments.

One of the goals of the current research was to determine whether the large influence of an eyewitness's decision in Dahl et al. (2006) studies could be due to a recency effect. Experiment 1 examined this possibility by manipulating the order in which the investigators received eyewitness information. If the impact of the eyewitness decision in prior studies was due to a recency effect, then the participant–investigators should be less influenced by that information if it is presented near the beginning of the investigation.

In addition to examining the influence of order effects on participant–investigators, another goal of the current

research was to examine how participant–investigators dealt with two similar forms of person evidence: an alibi witness and an identification eyewitness. Alibi witnesses testify regarding the suspect's account of where they were and what they were doing at the time the crime took place. Given that it is meant as a form of exoneration, an alibi implies that the person could not have been at the scene of the crime. An eyewitness also testifies about the whereabouts of the suspect in relation to a witnessed crime. Therefore, alibi witnesses and eyewitnesses share many similar attributes. They are both called upon to report their memory for an event, and as such, they are both vulnerable to the same memory errors (Burke, Turtle, & Olson, 2007). In addition, alibi witnesses and eyewitnesses also share the characteristic that they are a live and in-person form of evidence (as compared to other forms of evidence that are processed as written reports and therefore may lack some of the saliency and contextual cues of witness evidence). As such, these witnesses are likely to be seen as a more ambiguous form of evidence than physical evidence, not only because their memories might be faulty, but also because they are being judged on their verbal and non-verbal reactions when giving evidence, their demeanor, their clothing, etc. Further, in the alibi witness's case, the police likely take the witness's relationship with the suspect into account when assessing the credibility of the alibi. As such, it is possible that police investigators view alibi witnesses with more skepticism than they view eyewitnesses (who typically have no relationship with the suspect). Indeed, Burke and Turtle (2003) suggested that police are biased while interviewing alibi witnesses to look for inconsistencies and signs of deception.

Although a number of studies have examined the impact of alibis on jurors' decisions (e.g., Culhane & Hosch, 2004; Lindsay, Lim, Marando, & Cully, 1986; McAllister & Bregman, 1989; Sanders, 1984), only two studies (to our knowledge) have examined how participants in the role of police investigators interpret the evidence. Olson and Wells (2004) examined whether participants in the role of police investigators would be biased against alibi information, particularly when it came from someone who would potentially lie for the suspect. They found that an alibi corroborated by someone who would not likely lie about the alibi and also was not likely to mistakenly identify the suspect (e.g., a neighbor) was viewed as more believable than an alibi provided by someone who would lie for the suspect (e.g., the suspect's girlfriend).

Sommers and Douglass (2007) examined how participant–investigators interpreted alibis as compared to participant jurors. The participants read the alibi as part of a police file detailing an investigation or as part of evidence within criminal proceedings. The authors found that the participant jurors were more skeptical of the alibis than the

participant–investigators. They proposed that those in the juror condition presumed that the alibi must be relatively weak given that the case did go to trial.

One difference between the previous alibi research with participant–investigators and the current research is that all of the evidence in the previously described studies was presented via written materials. Although it is quite possible that an investigator would only encounter evidence through a report written by another officer, it is also possible that investigators would have face-to-face contact with alibi witnesses and eyewitnesses, and that this could affect how investigators' evaluate this evidence. In addition, investigators in the current line of research were much more involved in the investigative process than the participants in the previous studies.

Experiment 2 was designed to examine how role-playing police investigators evaluate alibi evidence (provided by an alibi witness) that is either strong or weak in regard to exonerating the suspect when they also have an eyewitness who has either identified the suspect or rejected the suspect (by not making an identification). Experiment 2 also explored the potential presence of order effects with this alibi and eyewitness evidence by examining all possible combinations of presentation order of the alibi witness and eyewitness testimony. If the evidence is identical but investigators are influenced by it in different ways depending on the order in which it was presented, this could have a dramatic impact on how investigators subsequently pursue the case.

Although the current research attempted to replicate aspects of an investigative experience, there are still many differences between the paradigm and real-world investigations. A major difference between our model system and real-world investigations is that our participant–investigators were undergraduates with no training or expertise in investigative work. It may be that the level of expertise of real police officers leads them to make decisions in a qualitatively different way from undergrad participants. Ultimately this is an empirical question that we hope to address in future research. But prior research provides little support for the idea that professionals differ qualitatively from lay people in their reliance on heuristics, susceptibility to biases, or ability to detect deception. Dawes, Faust, and Meehl (1989) discussed evidence that, although clinicians' diagnostic confidence increases with experience, their diagnostic accuracy often fails to do so. As mentioned earlier, medical doctors have been shown to be heir to the same biases as laypeople in their diagnostic decision-making. In the realm of deception detection, experienced police officers have not generally outperformed naïve undergraduates (e.g., Aamodt & Custer, 2006; DePaulo & Pfeifer, 1986; Kohnken, 1987; Kraut & Poe, 1980). Even if undergrads do qualitatively differ from police officers on

our task, it is unclear whether that difference would affect the impact of presentation order per se.

EXPERIMENT 1

In the original Dahl et al. (2006) studies, participant–investigators were dramatically over-influenced by the eyewitness's decision. If the witness identified the suspect, probability estimates regarding the likely guilt of the suspect increased dramatically. If the witness identified a known innocent lineup member or rejected the lineup, investigators' probability estimates plummeted, even when the other evidence against the suspect was strong. The goal of Experiment 1 was to examine whether the large influence of the eyewitness decisions found in the previous studies was due to a recency effect. In the current experiment, the procedure was manipulated to vary when the participant–investigators received the eyewitness decision. Participants either received the information after they reviewed the computer database of potential suspects and selected their suspect (as in previous studies), or they received it before they accessed the database and other information about the crime.

Method

Participants

Sixty male ($N = 13$) and female ($N = 47$) university undergraduates participated individually in return for bonus points in an introductory psychology course. Participants were randomly divided into the four conditions of a 2 (ID Decision: ID Suspect, Not Present) by 2 (Order: Database First, ID First) between-subjects design.

Materials and Procedure

Participants were informed that they would be participating in pairs and the sign-up website was rigged to make it appear that this was true. In fact, only one participant signed up for each session, as the other person was a confederate. A confederate witness was used to maintain consistency in behavior and apparent confidence, and to manipulate the identification decision. When participants arrived, they were informed that they would be taking on the role of a police officer in the experiment and were told that another participant (the confederate) would take on the role of an eyewitness.

Materials were based on a 3-min simulated crime video that depicted a robbery. After receiving instructions, participants interviewed the witness regarding this video. During the interview, the confederate responded in a fairly

confident manner with predetermined answers, the content of which was based on prior pilot studies of the video with real eyewitnesses. If a question was asked that was unrelated to the predetermined answers, the confederate answered that she did not know.

In the Database First condition, the participant was then given instructions for using a computer database to search for a suspect. Participants were told that they would examine a database containing potential suspects who all had previous arrests on file. They were informed that the culprit might not be in the database. The database provided information regarding each suspect's physical description, prior criminal record, alibi, current employment, and registered vehicles. Participants were instructed to imagine that all of the information was up to date. Consequently, if a suspect's physical description was not a good match to that given by the confederate-witness during the interview, then that suspect could not have committed the crime. Once the participants had selected a suspect they were shown a page containing their suspect's photo (the perpetrator in the video). The program was designed so that the same picture appeared regardless of which suspect was chosen.[1] After participants chose their suspect and saw their suspect's photo they saw the lineup. The participants were instructed that the lineup consisted of one person who could have committed the crime (their chosen suspect) and five innocent people (foils). (The match-description lineup was created by J. D. Read and has been used in many other experiments, e.g., Lindsay, Read, & Sharma, 1998.)

The participants were given instructions about the lineup procedure and administered the lineup to the confederate who looked over the lineup and then responded either "It's number three" (ID Suspect condition) or "He's not there" (Not Present condition).

Following the lineup, the participant completed a questionnaire. Participants rated how confident they were in the accuracy of the witness's decision on a scale from 1 to 10. Participants then estimated the probability that the suspect they chose had committed the crime using a scale from 0 to 100%. They also indicated whether they would arrest the suspect. Afterward, participants were fully debriefed regarding the purpose of the experiment and the use of the confederate.

The ID First condition was virtually identical to the Database First condition except that after the initial interview with the witness, the witness was asked to step out of the room and the participant investigator was given instructions for the lineup procedure. The participant was told to imagine that a fellow police officer had put together a lineup based on the eyewitness's description. Participants

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[1] However, all participants in this study chose the same suspect as the database was designed to suggest the guilt of that suspect.

were instructed that number three in the lineup was the other officer's suspect and that everyone else in the lineup was in jail and therefore was innocent. Participants were reminded that just because number three was a suspect, it did not necessarily mean that he had committed the crime. The participants were then given the same instructions for administering the lineup as the participants in the Database First condition. The witness was brought back into the room and the participant administered the lineup to the witness.

Following the lineup procedure, the investigator was given the instructions for the database. Participants were told to imagine that regardless of the eyewitness's lineup decision, as police investigators they would want to make sure they had pursued all of their options while searching for the likely culprit of the crime. Therefore, they were going to go through a database of potential suspects. The database and instructions for the database were identical to those used in the Database First condition. When the participants chose their suspect they were shown a photo of their suspect and the photo was identical to the photo of lineup member three that they had earlier been told was the suspect in the lineup. After completing the database, the participants completed the same questionnaire as participants in the Database First condition.

Results

Probability Suspect Committed Crime

A 2 (Order: ID First, Database First) × 2 (ID Decision: ID Suspect, Not Present) between subjects ANOVA was conducted on participants' estimates of the probability that the suspect was the culprit. There was a significant interaction, $F(1, 56) = 20.29$, $p < .01$, $\eta_p^2 = .27$ (see Fig. 1). Probability ratings were near ceiling levels in the ID Suspect conditions regardless of when that identification took place, $t(28) = .82$, $p = .42$, Cohen's $d = .30$. When the witness rejected the lineup, probability ratings were lower when the database came first than when the ID came first, $t(28) = 4.53$, $p < .01$, Cohen's $d = 1.65$.

Confidence in the Witness

There was a significant interaction between order and ID decision on participants' confidence in the witness, $F(1, 56) = 13.41$, $p < .01$, $\eta_p^2 = .19$ (see Fig. 2). In the ID Suspect conditions, participants were highly confident in the witness's decision regardless of when that decision took place, $t(28) = .19$, $p > .10$, Cohen's $d = .07$. In the Not Present conditions, participants who went through the database before receiving the ID were significantly more confident in the witness than those who obtained the ID
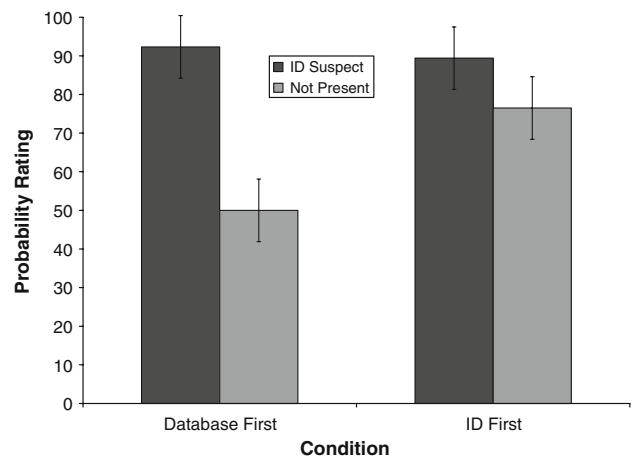

Fig. 1 Experiment 1 questionnaire 2 mean probability ratings that the suspect committed the crime. Error bars = 95% CIs based on a pooled estimate of variability (The pooled estimate is the error term for the between-subjects factor in the ANOVA analysis. Pooling the estimates of variability provides a more stable estimate of variability. Given the pooled estimate of variability, it is appropriate to compare the different between-subjects conditions with one another using the error bars. See Masson & Loftus, 2003, for a complete explanation of the computation and use of these confidence intervals)
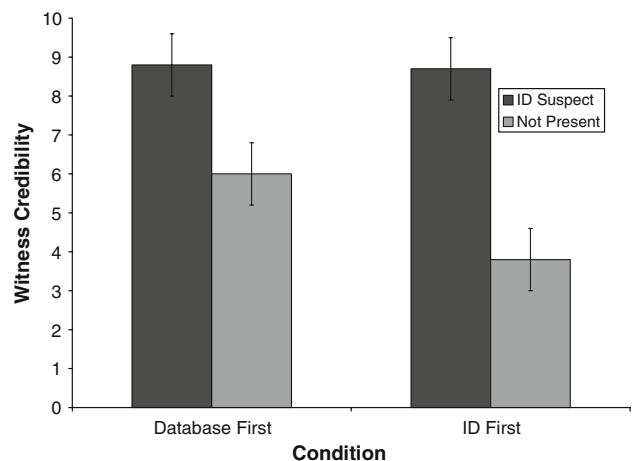

Fig. 2 Experiment 1 mean ratings of witness credibility. Error bars = 95% CIs based on a pooled estimate of variability

before going through the database, $t(28) = 4.19$, $p < .01$, Cohen's $d = 1.53$.

Arrest Decision

There was a significant interaction between order and ID decision on arrest decision using a two-tailed Fisher Exact Probability Test, ($p < .05$). There were no significant differences in willingness to arrest the suspect when the witness identified the suspect (ID First: 14/15, DB First: 13/15), ($p = .8$). There was, however, a significant difference between the ID First/Not Present condition (10/15)

and the Database First/Not Present condition (1/15), such that participants were more willing to arrest their suspect when the witness rejected the lineup before the participant went through the database, $\chi^2(1) = 11.63$, $p < .01$.

Discussion

A recency effect does not appear to be completely responsible for the impact of the eyewitness identifications found in the previous Dahl et al. (2006) studies. In the ID Suspect conditions, investigators rated the probability that their suspect had committed the crime near ceiling levels regardless of when that identification occurred.

However, a recency effect did appear in the Not Present conditions. When the disconfirming ID decision occurred early on in the procedure, participant–investigators were more likely to disregard this evidence when subsequent evidence suggested the guilt of the suspect. Participants in this condition also rated their confidence in the witness significantly lower than participants in the Database First/Not Present condition.

Hogarth and Einhorn (1992) argued that when people are presented with a short set of evidence and are asked to update their beliefs using step-by-step processing (i.e., they are repeatedly asked to assess their beliefs throughout the procedure) there will be no order effects when the evidence is consistent (that is, both pieces of evidence confirm the participant's beliefs or both disconfirm the participant's beliefs) but that there will be a recency effect when the evidence is contradictory. Our findings are consistent with this claim.

A potential confound in our procedure was the way in which the lineup was presented to the investigators in the ID First condition. To inform the investigators who the suspect was in the lineup, participants were asked to imagine that the lineup had been put together by a fellow police officer who had reason to believe that the suspect might have committed the crime. In the Database First conditions, participants did not receive this instruction because they understood that the lineup was constructed around their own chosen suspect. This could have suggested to investigators in the ID First condition that there was a greater likelihood that the suspect had committed the crime because another police officer also believed (perhaps with good reason) that that suspect was the culprit. Therefore, investigators in the ID First condition may have treated the fact that their fellow officer had put together the lineup as additional support for the guilt of their suspect. If this were the case, one might expect the investigators in the ID First condition where the witness identifies their suspect to be completely confident in the guilt of that suspect, but there were no significant differences between the Database First- and ID First-ID Suspect conditions (although this might be due to ceiling effects).

Although recency effects cannot offer a complete explanation for the impact of the eyewitness decision on the participant–investigators, it does appear that presentation order can dramatically affect some decisions. In the Not Present conditions, the order in which the participant–investigator received the disconfirming evidence had a tremendous impact on their arrest decisions, with only one person willing to arrest the suspect when the lineup rejection came at the end of the procedure, whereas 10 people were willing to arrest the suspect when that decision occurred near the beginning of the procedure before the investigators had gone through the database. As such, it appears that the order in which evidence is received can have a large influence on investigative decisions.

EXPERIMENT 2

Experiment 1 suggested that order of presentation of information can influence how that information is weighed. Experiment 2 added alibi evidence into the mix by examining how participant–investigators deal with eyewitness identification evidence and alibi witness evidence when they both confirmed the investigator's hunch, both disconfirmed the investigator's hunch, or were contradictory regarding the guilt of the suspect. Of particular interest was whether the presentation order of this contradictory information would have an effect.

Method

Participants

One hundred and sixty-eight male ($N = 37$) and female ($N = 131$) university students participated individually in return for bonus points in an introductory psychology course. Participants were randomly divided into the experimental conditions. The study was a 2 (ID Decision: ID Suspect, Not Present) by 2 (Alibi Strength: Strong Alibi, Weak Alibi) by 2 (Order: Eyewitness First, Alibi First) between-subjects design.

Materials and Procedure

The database was identical to that used in Experiment 1, except that the alibi information was removed. In the current study the database was always presented before the eyewitness and alibi witness evidence. After participants arrived and were told about their role in the study, they were presented with a written description of the crime and culprit in the form of a police file.

Following the database, participants were shown a video of either an alibi witness or an identification eyewitness.

The alibi video showed the alibi witness providing either a weak or a strong alibi for the suspect.[2] The weak and strong alibi conditions were based loosely on the alibis used by Olson and Wells (2004), which were brief and presented in written form. Therefore, in the current study the alibis were expanded to be narrative in structure and to provide more contextual information for the participant–investigators.

In the weak condition, the alibi was provided by the suspect's closest male friend who reported that they had gone out of town on a whim and had not kept any receipts or other form of physical evidence. In the strong alibi condition, in contrast, the alibi provider was a male co-worker of the suspect's who was sent out of town with the suspect for a work-related conference. The alibi provider claimed to have copies of hotel receipts in the suspect's name.

The eyewitness identification video showed the eyewitness being interviewed (by a hidden experimenter) about the crime using the same procedure as in Experiment 1. The interviewer questioned the witness about the crime and then the witness completed the lineup identification task. The screen was divided in half at this point so that one half of the screen showed the witness and the other half showed a close-up of the lineup. The witness either identified the suspect by pointing to the picture and saying the lineup member's number aloud or rejected the lineup by reporting that the culprit was not present.

To maintain consistency between the alibi and eyewitness videos, both videos were shot in the same room and both used males who were dressed similarly and who were both of the same ethnicity (white) and age (mid 1920s). Both actors were filmed performing all roles of eyewitness and alibi provider, and the videos were pilot tested to ensure that participants did not find one actor more convincing than the other. In addition, the videos were counter-balanced so that half of the participant–investigators saw actor 1 as the eyewitness and actor 2 as the alibi witness and the other half saw actor 2 as the eyewitness and actor 1 as the alibi witness.

After the participants saw the first video of either the alibi witness or the eyewitness, they were given the first questionnaire, which asked them to rate the probability that their suspect had committed the crime and asked them to indicate whether they would arrest the suspect at that point. Once they completed the questionnaire, participants were shown the second video of either the alibi witness or eyewitness (whichever one they did not originally watch) and again completed a questionnaire identical to the first questionnaire except that they were asked to assess the

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[2] Both the strong and weak videos were pilot tested to ensure that they were viewed as appropriately strong and weak alibis. In the weak alibi condition the mean was 3.14 with a standard deviation of 1.33. In the strong alibi condition the mean was 7.83 with a standard deviation of 1.54.

credibility of the eyewitness's identification decision and the alibi evidence.

Results

Effect of Actor on Questionnaire Measures

Analyses were conducted (on all measures from both questionnaires) to determine whether differences existed between the two actors. There were no significant differences based on the actor (all p's > .5).

First Questionnaire Probability Suspect Committed Crime

A number of planned comparisons using the Bonferroni correction were carried out to determine whether one form of evidence (eyewitness decision or alibi evidence) was more compelling than the other. There was no significant difference between the ID Suspect condition ($M = 72.12$, $SD = 21.69$) and the Weak Alibi condition ($M = 68.89$, $SD = 23.39$), $t(166) = .93$, $p > .30$, Cohen's $d = .14$. Similarly, there was no significant difference between the Not Present condition ($M = 52.21$, $SD = 25.94$) and the Strong Alibi condition ($M = 55.44$, $SD = 26.55$), $t(166) = .80$, $p > .40$, Cohen's $d = .12$. Therefore, the investigators did not appear to treat the alibi evidence with more skepticism than the eyewitness evidence.

First Questionnaire Arrest Decision

Participants were asked whether they would arrest the suspect. There was a significant main effect of ID Decision, $\chi^2(1) = 13.21$, $p < .001$, Cramer's $V = .28$, $p < .001$. When the witness identified the suspect, participants were more likely to arrest the culprit (38/84) than when the witness rejected the lineup (16/84). There was also a significant main effect of alibi, $\chi^2(1) = 5.35$, $p < .05$, Cramer's $V = .18$, $p < .05$. Those in the Weak Alibi condition were more likely to arrest the suspect (34/84) than those in the Strong Alibi condition (20/84).

Second Questionnaire Probability Suspect Committed Crime

A 2 (Order: Alibi First, Eyewitness First) × 2 (Alibi: Strong, Weak) × 2 (ID Decision: ID Suspect, Not Present) between-subjects ANOVA was conducted on participants' second questionnaire estimates of the probability that the suspect was the culprit. Although there were significant main effects of the Eyewitness Decision and Alibi, these are relatively uninteresting given the significant interactions that were found. There was a significant interaction between Order and

Alibi, $F(1, 160) = 9.67$, $p < .01$, $\eta_p^2 = .06$. Participants who received the Strong Alibi rated the probability that their suspect committed the crime significantly lower when that alibi was presented after the eyewitness ID decision ($M = 30.92$, $SD = 26.56$) than when it was presented before the eyewitness decision ($M = 46.07$, $SD = 35.36$), $t(82) = 2.22$, $p < .05$, Cohen's $d = .48$. There was no significant order effect in the Weak Alibi condition, $t(82) = .89$, $p > .30$, Cohen's $d = .20$.

There was also a significant interaction between Order and Eyewitness Decision, $F(1, 160) = 9.38$, $p < .01$, $\eta_p^2 = .06$. Participants in the ID Suspect condition rated the probability that their suspect was the culprit higher if they received that identification decision after receiving the alibi ($M = 79.85$, $SD = 21.26$) than if they received it before the alibi ($M = 64.86$, $SD = 30.41$), $t(82) = 2.62$, $p < .05$, Cohen's $d = .57$. There was no significant difference between orders in the Not Present condition, $t(82) = .97$, $p > .30$, Cohen's $d = .21$. There was also no significant interaction between the ID Decision and the Alibi, $F(1, 160) < 1$.

Finally, there was a significant three-way interaction, $F(1, 160) = 3.94$, $p < .05$, $\eta_p^2 = .02$ (see Fig. 3). In the condition in which the alibi was strong but the witness identified the suspect, probability ratings were lower when the alibi came after the witness decision than when the alibi came before the witness's decision, $t(40) = 4.23$, $p < .001$, Cohen's $d = 1.31$. Ratings of the suspect's guilt within the ID Suspect/Weak Alibi conditions, Not Present/Strong Alibi conditions, and Not Present/Weak Alibi conditions did not differ significantly based on the order in which the

information was received (all p's $> .2$). Therefore, the order of presentation of evidence only had a significant effect in the ID Suspect/Strong Alibi condition.
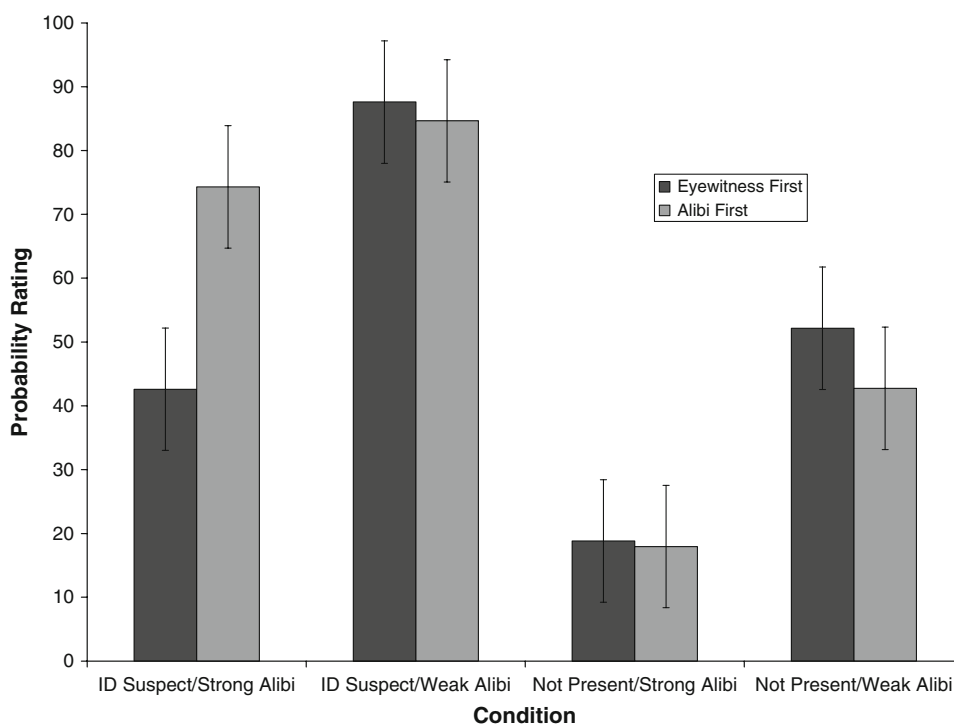
Second Questionnaire Credibility of the Witness Decision

Participants were asked to rate on a scale from 1 to 10 how credible they thought the eyewitness's decision was. There was a significant two-way interaction between Eyewitness Decision and Alibi, $F(1, 160) = 16.53$, $p < .001$, $\eta_p^2 = .09$ (see Table 1). In the Strong Alibi condition, participants thought the witness's ID decision was equally credible regardless of what that decision was, $t(82) = .92$, $p > .30$, Cohen's $d = .20$. In the Weak Alibi condition, participants whose witness identified the suspect thought that decision

Table 1 Experiment 2 questionnaire 2 credibility results

	Witness credibility	Alibi credibility
ID first		
ID suspect/strong alibi	5.95 (1.77)	6.24 (2.10)
ID suspect/weak alibi	8.19 (1.33)	2.48 (1.36)
Not present/strong alibi	6.62 (1.86)	7.10 (1.89)
Not present/weak alibi	5.71 (1.74)	3.19 (1.78)
Alibi first		
Strong alibi/ID suspect	7.48 (2.06)	5.10 (2.12)
Weak alibi/ID suspect	8.05 (1.69)	2.71 (1.35)
Strong alibi/not present	6.05 (1.63)	5.90 (1.67)
Weak alibi/not present	5.38 (1.80)	2.95 (1.43)

Fig. 3 Experiment 2 questionnaire 2 mean probability ratings that the suspect committed the crime. Error bars = 95% CIs based on a pooled estimate of variability

was more credible than when the witness rejected the lineup, $t(82) = 7.21$, $p < .001$, Cohen's $d = 1.57$. In addition, when participants were in the ID Suspect condition, they thought that decision was less credible when there was a Strong Alibi as compared to a Weak Alibi, $t(82) = 3.58$, $p < .001$, Cohen's $d = .79$. However, in the Not Present condition, participants thought the decision was less credible when there was a Weak Alibi rather than a strong alibi, $t(82) = 2.10$, $p < .05$, Cohen's $d = .44$.

There was also a significant interaction between Order and Eyewitness Decision, $F(1, 160) = 4.50$, $p < .05$, $\eta_p^2 = .03$. When the alibi was presented before the eyewitness decision, participants thought the witness's decision was more credible when the witness identified the suspect than when the witness reported that the suspect was not present, $t(78) = 5.21$, $p < .01$, Cohen's $d = 1.16$. However, when the alibi was presented after the eyewitness decision, participants were similarly confident in the decision, regardless of what the decision was, $t(78) = 2.12$, $p > .05$, Cohen's $d = .48$. There were no significant differences within the ID Suspect and Not Present conditions as a function of the order in which they were received (all p's > .10). There was no significant three-way interaction, $F(1, 160) = 3.13$, $p = .08$, $\eta_p^2 = .02$.

Second Questionnaire Perceived Credibility of the Alibi

Participants rated how credible they thought the alibi was on a scale from 1 to 10. There was a significant main effect of Alibi strength, $F(1, 160) = 146.97$, $p < .001$, $\eta_p^2 = .48$. Participants in the Strong Alibi condition ($M = 6.08$, $SD = 2.05$) believed the alibi to be more credible than participants in the Weak Alibi condition ($M = 2.83$, $SD = 1.49$). There was also a significant main effect of Eyewitness Decision, $F(1, 160) = 5.97$, $p < .05$, $\eta_p^2 = .04$. Participants in the ID Suspect condition ($M = 4.13$, $SD = 2.36$) believed the alibi to be less credible than participants in the Not Present condition ($M = 4.79$, $SD = 2.44$).

There was a significant interaction between the Order in which the alibi was presented and the Alibi Strength, $F(1, 160) = 4.74$, $p < .05$, $\eta_p^2 = .03$ (see Table 1). When participants were in the Strong Alibi condition, they thought the alibi was more credible when it was presented after the Eyewitness Decision rather than before, $t(82) = 2.71$, $p < .01$, Cohen's $d = .59$. There was no significant difference in credibility ratings of the alibi in the Weak condition, $t(82) = 0$. No other interactions were significant (all p's > .5).

Second Questionnaire Mixed Measures ANOVA of Alibi Provider Credibility and Eyewitness Credibility

A mixed measures ANOVA was conducted to compare the credibility ratings of the Alibi and the Eyewitness decision.

There was a significant within-subjects interaction between Order and Alibi, $F(1, 160) = 6.40$, $p < .05$, $\eta_p^2 = .04$ (see Table 1). Using the Bonferroni correction, t-tests revealed that the Eyewitness Decision was always rated as more credible than the Alibi information (all p's < .01) except for the condition in which the Eyewitness Decision was presented first and there was a subsequent Strong Alibi, in which case the two were rated as similar in credibility ($p > .30$). There were no other significant within-subjects interactions (all p's > .12).

Second Questionnaire Arrest Decision

There was a significant main effect of ID Decision, such that when the witness identified the suspect, participants were more likely to arrest the suspect, $\chi^2(1) = 43.91$, $p < .001$, Cramer's $V = .51$, $p < .001$. There was also a main effect of Alibi: participants were more willing to arrest in the Weak Alibi condition than in the Strong Alibi condition, $\chi^2(1) = 11.52$, $p < .001$, Cramer's $V = .26$, $p < .001$. There was no significant main effect of Order, $\chi^2(1) = .24$, $p > .5$, Cramer's $V = .04$, $p > .5$. All of the two-way interactions were significant (all p's < .05). Further, a log-Linear analysis revealed a significant three-way interaction, $G^2(7) = 59.14$, $p < .001$ (see Fig. 4). Similar to the results found on the suspect culpability measures, order affected participants' decisions to arrest only in the Strong Alibi/Eyewitness ID condition.
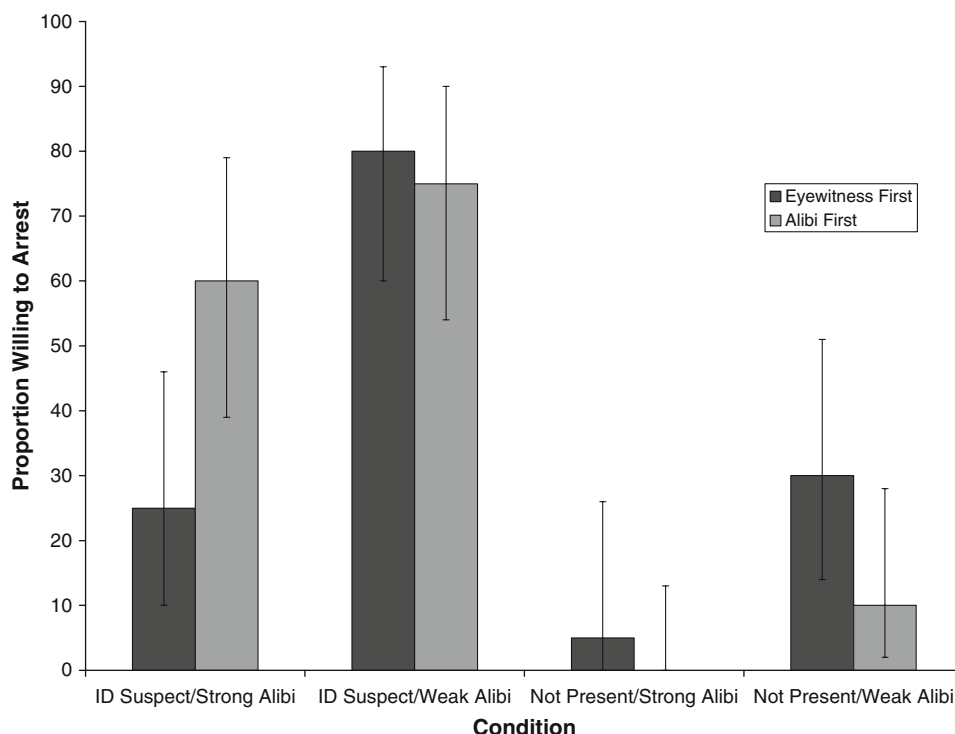
Discussion

One question of interest in Experiment 2 was whether one type of evidence (alibi or eyewitness) would be inherently more influential than the other for investigators. Given that alibi providers might be more likely to lie than eyewitnesses, it was hypothesized that investigators would be less influenced by the alibi information than by the eyewitness information. We found no evidence to suggest that this was the case.

Of particular interest was whether the alibi evidence and eyewitness evidence would have differential effects depending on the order in which they were presented. A recency effect was observed in the ID Suspect/Strong Alibi conditions. When the witness identified the suspect after the participant–investigator had received the strong alibi, the final probability ratings were higher than when the witness identified the suspect before the participant–investigator learned of the strong alibi. Similar results were found for investigators' willingness to arrest the suspect. Therefore, similar to Experiment 1, and consistent with the predictions made by Hogarth and Einhorn (1992), a recency effect only occurred in the condition in which the information was highly contradictory.

We did not see the same recency effect when the witness rejected the lineup and there was a weak alibi. One could

Fig. 4 Experiment 2 questionnaire 2 proportion willing to arrest the suspect. Error Bars = 95% confidence intervals of the cell means

also view these conditions as containing contradictory information, as the weak alibi suggests that the suspect could have committed the crime but the witness did not identify him. One possible reason for the lack of order effects in these conditions is that the participant–investigators may have viewed both these types of evidence as more ambiguous or less probative than the positive identification/strong alibi. The rejection of the lineup may have been interpreted as a failing of the witness to recognize the culprit, and a weak alibi does not necessarily mean that the suspect is guilty. Therefore, it is only when two pieces of evidence have opposing implications and they are both viewed as probative that a strong order effect is observed.

Therefore, the results of Experiment 2 suggest that the order in which participant–investigators receive evidence can affect their beliefs in their suspect's guilt, their willingness to arrest the suspect, and their beliefs regarding the credibility of the eyewitness and the alibi evidence. Given that real-world police investigators likely routinely encounter contradictory evidence when investigating a case, this suggests that the order in which they receive this information could affect how they pursue such an investigation.

GENERAL DISCUSSION

Impact of the Eyewitness

Previous research using this paradigm (Dahl et al., 2006) found that eyewitness decisions over-influenced role-playing police investigators, regardless of the decision that the witness made or the level of confidence that the participant–investigator had in the suspect prior to the eyewitness decision. It was hypothesized that a recency effect might be responsible for the vast influence of the eyewitness decision because the eyewitness decision occurred at the end of the experimental paradigm. However, the current research demonstrated that eyewitness decisions continued to have an enormous impact on participant–investigators, such that participant–investigators were always highly influenced by an eyewitness who identified their suspect (particularly in the first experiment). Recency effects were only found when the participant–investigators were trying to integrate two highly contradictory pieces of evidence. When the information was not highly contradictory it had an additive effect on participants' beliefs.

Therefore, the impact of the eyewitness decision on participant–investigators cannot simply be explained away by a recency effect. Numerous experiments using this paradigm (assessing many different variables) have now consistently revealed that eyewitness identification decisions are extremely influential for participant–investigators.

Order Effects

Experiments 1 and 2 provide support for the adjustment model proposed by Hogarth and Einhorn (1992), which predicted that when using a step-by-step assessment procedure contradictory information will result in a recency effect whereas complementary information will have an

additive effect. However, Hogarth and Einhorn provided no clear psychological theory to explain why people are affected by contradictory information in this way. A particular concern in the area of police decision-making is the phenomenon of tunnel vision (e.g., FTP Heads of Prosecutions Committee Working Group, 2004; Scullion, 1994). The current research suggests that with highly contradictory information and repeated belief updating, tunnel vision (or a confirmation bias) would not likely occur. However, the current research also only presented participant–investigators with two forms of evidence (alibi and eyewitness), and real-world investigators likely have to evaluate many other types of evidence as well, and do so over an extended period.

Further, police investigations might be better suited to an end-of-sequence processing style (Hogarth & Einhorn, 1992) such that their beliefs regarding the suspect's guilt are only assessed near the end of the investigation when they are making the decision whether to arrest the suspect or not. However, theorists also suggest that even though a task might be inherently end-of-sequence in design, people might still use step-by-step processing if the information that they are encountering is particularly complex because there is no mechanism to stop decision-makers from spontaneously making step-by-step judgments before being asked for their final decision (Hogarth & Einhorn, 1992). Therefore, given the often complex nature of criminal investigations, it is likely that investigators could use a step-by-step process such that they update their beliefs regarding the likely guilt of their suspect with each new piece of evidence.

Impact of the Alibi

Although researchers have suggested that police might approach alibis with more skepticism than they would other evidence (e.g., Burke & Turtle, 2003), this was not the case with the participant–investigators in Experiment 2. Nevertheless, our participants did generally rate the alibi provider as being less credible than the eyewitness and also rated the strong and weak alibis as less believable than in previous research (Olson & Wells, 2004). This suggests that the believability of alibis should be examined within the context of other evidence in the case rather than independently.

Research examining the impact of alibis on jurors' decision-making has found mixed results. McAllister and Bregman (1989) found that conviction rates were lower when an alibi witness provided an alibi for the defendant; however, we found this to be the case only when the strong alibi was presented after the eyewitness decision. Lindsay et al. (1986) found that when an eyewitness identified the suspect only a strong alibi affected verdicts. This was the

case in our Experiment 2 as well; the weak alibi barely affected ratings of the suspect's guilt in the ID Suspect conditions. Consequently, the current research provides support for the finding that weak alibis are not likely to affect people's assessments of the suspect's guilt when the eyewitness has identified the suspect. However, this research adds considerably to the literature by suggesting that a strong alibi will have a differential impact on decision-makers depending upon the order in which it was received relative to the eyewitness identification.

Further, this research also extends current alibi research by examining the influence of the alibi on decision-makers when the eyewitness does not identify the suspect. All previous alibi studies have only examined what happens when the witness identifies the suspect. Although this makes sense for jury research (because an eyewitness is not likely to be asked to testify if he rejected the lineup and therefore did not identify the defendant), police investigators sometimes do encounter witnesses who reject the lineup and have to evaluate alibi evidence in light of that witness non-identification.

Investigator Expertise

One significant difference between the participant–investigators and real-world police investigators is their experience with both the investigative process and the various forms of evidence. One might predict that expertise with investigations and evidence would lead investigators to be less biased in their decision-making and, therefore less susceptible to order effects. However, as noted in the introduction, other similar decision-making research suggests that this might not be the case.

If expertise does not always lead to better performance for trained police officers and medical doctors, it seems quite possible that real police investigators would be susceptible to the order effects found in the current studies. In fact, it seems quite likely that expertise with investigative procedures and different forms of evidence would not inoculate police against basic decision-making biases such as recency effects. Nevertheless, further research is needed that evaluates real police investigators to determine whether this is the case.

This research is the first to test the hypothesis that order effects might occur in police investigations. Research examining mock jurors has found that recency effects can occur when judging the guilt of a defendant. However, jurors' decision-making experiences within a courtroom are qualitatively different from police investigators' decision-making during criminal investigations. Jurors' verdicts are based on what was presented to them by the attorneys, whereas police investigators are directly involved in trying to ascertain who committed the crime. If

a mistake is made or the evidence is not strong enough, investigators are likely to feel far more personally responsible than jurors. As such, their interpretations of the evidence in the case are potentially affected by their prior beliefs about the suspect.

In conclusion, these studies provide an important initial examination of the influence of order of presentation of evidence and alibi versus eyewitness decisions on participants' judgments regarding the guilt of their suspect, the credibility of the evidence provider, and their willingness to arrest their suspect based on the evidence that they have obtained. Although it would be premature to generalize to the real world at this point, this research suggests a dire need for an examination of real police investigative procedures and decision-making.

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